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Ornithology



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THE CONDOR

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THE CONDOR

VOLUME 45

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NUMBER 2

THE ZOOGEOGRAPHIC POSITION OF THE HAWAIIAN ISLANDS

By ERNST MAYR

Islands offer a special problem to the zoogeographer. As long as they are small and not too far offshore, they can safely be included in the same zoogeographic region with the nearest mainland. Doubts, however, arise in regard to the larger and more isolated islands. Most of the birds of New Zealand, for example, apparently arrived there from Australia. But some of the endemics are so unique and the unchanged Australian element is so small, that it seems hardly justified to include New Zealand in the Australian Region. The same is true for Madagascar. In addition to an unquestionable African element the bird fauna of this island has a large endemic element (including eight families) and a surprisingly large Oriental element (Rand, Bull. Amer. Mus. Nat Hist., 72, 1936:294-299). An island with such a faunal composition obviously cannot be included with the Ethiopian Region, as strictly defined.

Another island group which causes difficulties, at least to the ornithologist, is the Hawaiian Archipelago. For about one hundred years zoogeographers have associated these islands with Polynesia, apparently for reasons of geographical position and because the native humans are Polynesians. The fauna was practically unknown at the time when this classification was first proposed. In more formal zoogeographic studies the archipelago was either included in the "Polynesian Subregion of the Australian Region" or it was accorded the rank of an "Hawaiian Subregion," a course which I followed in my recent study of the borders of the Polynesian Subregion (Proc. Sixth Pac. Sci. Congr. (1939), 4, 1941:132-133).

Since then I have made a more thorough analysis of the Hawaiian bird fauna and have found that its relationship with the Polynesian fauna is slight indeed. The total number of species of native Hawaiian land birds is open to doubt, since many of them are geographic representatives of each other and are considered full species by some authors, subspecies by others. There is, however, little doubt that these birds owe their origin to 14 separate invasions. These invasions are the following, here listed according to their probable age with indication of relationships and sources:

Endemic family

- (1) Drepaniidae; related to cardueline finches or tanagers (American or Palearctic).

Endemic genera

- (2) *Pennula*, rail; relationship unknown.
(3) *Moho*, *Chaetoptila*—honeyeaters; related to *Amoromyza* and other honeyeaters (Australasian).
(4a) *Phaeornis*, thrush; related to *Myadestes* (American).
(4b) *Chasiempis*, flycatcher; related to the *Monarcha* group (*Pomarea*, *Mayrornis*, etc.) (Polynesian).
(4c) *Nesochen*, goose; related to *Branta* (American).

Endemic species

- (5a) *Corvus tropicalis*, crow; related to continental *Corvus* (Holarctic).
- (5b) *Buteo solitarius*, hawk; related to *Buteo swainsoni* (American).
- (5c) *Anas wyvilliana*, duck; related to *Anas platyrhynchos* (Holarctic).

Endemic subspecies

- (6a) *Asio flammeus sandwichensis*, Short-eared Owl (Holarctic).
- (6b) *Himantopus himantopus knudseni*, Stilt (American).
- (6c) *Gallinula chloropus sandwichensis*, Waterhen or Gallinule (American).
- (6d) *Fulica americana alai*, Coot (American).

Not endemic

- (7) *Nycticorax nycticorax hoactli*, Black-crowned Night Heron (American).

THE TAXONOMIC POSITION OF SOME OF THE HAWAIIAN ENDEMICS

The reliability of zoogeographic conclusions depends to a large extent on the soundness of the taxonomic work carried out on the groups studied. It is, therefore, of primary importance to determine the taxonomic position and nearest relatives of the Hawaiian endemics. There is no difficulty in regard to 7, 6d, 5b, and 4c of the preceding list; they are unquestionable American elements. The species to which 6b and 6c belong are widespread, but the endemic Hawaiian subspecies are closer to the American than to the Eurasian forms. One glance at the map is sufficient to convince one that the Holarctic immigrants (Drepaniidae, *Corvus*, *Anas*, *Asio*) probably also came from North America, since it is considerably closer to Hawaii than is Asia. The Hawaiian thrushes (*Phaeornis*) are descendants of the American *Myadestes* (Amadon, Condor, 44, 1942:280).

The taxonomic position of the Hawaiian Flightless Rail (*Pennula*) is and will probably remain doubtful. This genus has lost all distinctive characters and is now merely a nondescript-looking, small, brownish rail with a reduced wing. It is possibly related to the Polynesian *Aphanolimnas-Porzanoidea-Nesophylax* stock, but it seems equally possible that it is a descendant of one of the genera of Holarctic rails (*Porzana*, *Rallus*).

The Hawaiian Crow has certain peculiar characters that have appeared repeatedly in island forms of the genus *Corvus*. (Compare, for example, *C. jamaicensis* with *C. ossifragus*, and *C. fuscicapillus* with *C. validus*.) The plumage has lost its gloss and the individual feathers tend to be looser, more decomposed. The deep bill and the graduated tail suggest that the raven might be its nearest relative on the American mainland. However, according to Peale, the voice resembles that of the Fish Crow (*C. ossifragus*). North America is almost certainly the home of the ancestor of the Hawaiian Crow, even though the exact ancestral species may be in doubt.

All the genera and families mentioned up to now are represented in Hawaii by only one or two species. All of them together do not add up to the number by which the single family Drepaniidae is represented on the Hawaiian Islands. (*Drepanis* comes from the Greek word *δρεπανη*, the sickle. The latinized stem of this word is drepani and by adding the family ending -idae, we get Drepaniidae. Gadow used the spelling Drepanididae, Sushkin Drepanidae; neither one seems to be formed correctly.) The exact determination of the relationship of this diversified family is obviously of paramount importance. This group has had a tortuous taxonomic history. The genera belonging to it were originally scattered among the Fringillidae, Dicaeidae, Nectariniidae and Meliphagidae. Gadow (in Wilson and Evans, *Aves Hawaiensis*, 1891-1899:219-249) finally united them in the family Drepanididae, on the insistence of the field naturalist Perkins, whose observations of live birds had convinced him that the thick-billed and long-billed forms were closely related. Gadow concluded that they were more

closely related to the Coerebidae than to the Tanagridae, but he did not make a very good case for this assumption since he did not compare them with typical tanagers. Sushkin (Verh. VI Int. Ornith. Kongr., 1929:379), on the other hand, presented some seemingly strong arguments in favor of a cardueline relationship. Birds like the goldfinches, purple finches, pine grosbeaks and crossbills would, according to him, be the nearest relatives of the Drepaniidae. Sushkin, however, fails to answer some of Gadow's objections against a cardueline relationship (nasal apertures, crop, etc.) and it seems, therefore, as if the last word had not yet been said. So much is certain that America or Northern Asia must be the home of the ancestors of the Drepaniidae, since tanagers as well as cardueline finches are entirely absent from Polynesia and from the Australian-Papuan Region.

TIME OF SETTLEMENT

The Hawaiian fauna has all the earmarks of that of an oceanic island. There is not a single serious modern student (I use the term *serious* advisedly) who believes in the former existence of land bridges between America and Hawaii, or between Polynesia and Hawaii. Oceanic islands are colonized at different times by accidental stragglers. The different degree of distinctness which the descendants of the bird settlers on Hawaii have attained can be considered as irrefutable proof for the fact that they did not reach the islands simultaneously.

FAUNAL ORIGIN OF THE HAWAIIAN BIRDS

Summary

American: 4a, 4c, 5b, 6b, 6c, 6d, 7.....	7
(numbers refer to preceding tabulation)	
Holarctic: 1, 5a, 5c, 6a	4
Polynesian: 3, 4b	2
Unknown: 2	1
Total	14

Eliminating the single doubtful element (*Pennula*), we find that eleven of the thirteen colonizations of Hawaiian birds probably came from North America and only two from Polynesia (Honeyeaters, *Chasiempsis*). All non-passerine immigrants came from America, whereas the five colonizations of song birds are rather evenly divided (2 from Polynesia, 3 from America). Both Polynesian colonizations must be of considerable antiquity, since one of them produced an endemic genus and the other evolved even into two endemic genera (*Moho*, *Chaetoptila*). The oldest and most diversified group of Hawaiian birds, the Drepaniidae, has branched out into about 12 genera, 22 species and a total of 42 recognizable species and subspecies.

THE ZOOGEOGRAPHIC POSITION OF HAWAII

It is self-evident from the preceding remarks that the Hawaiian avifauna shows an overwhelming preponderance of North American, that is, Holarctic elements. The Polynesian element consists merely of one monotypic species of honeyeaters (*Chaetoptila angustipluma*), of one superspecies of honeyeaters (*Moho nobilis*), of one polytypic species of Old World flycatchers (*Chasiempsis sandwicensis*), and possibly of a single polytypic species of rails (*Pennula sandwicensis*). The American or Holarctic element consists of at least 32 species or superspecies. On this basis the Hawaiian Islands should be included with the Nearctic Region, in fact a case might even be made for including them in the next "A.O.U. Check-list"! However, it seems that the case

of the birds is unique. All the workers on plants, insects, arachnids, and mollusks agree that the Hawaiian fauna of these groups is overwhelmingly Polynesian. It will, therefore, be wisest to evaluate the ornithological data in conjunction with the evidence from all the other groups, and to associate the Hawaiian Islands with the Australian Region, provided one believes at all in the principle of zoogeographic regions. There is, of course, a growing school of students who deny the validity of zoogeographic regions (see Dunn, *Science*, 56, 1922:336-338, for an early reference). They claim that there are faunas, but not regions. They say that one can speak of Nearctic and Palearctic faunas, but not of Palearctic or Nearctic regions. This is true for continents but even truer for islands.

I would now like to revert to the discussion at the beginning of this paper. Should the West Indies be included with the Neotropical or with the Holarctic Region, should Madagascar be associated with the Ethiopian or with the Oriental Region, should Celebes or New Guinea be included with the Oriental or with the Australian Region, or should perhaps all of these islands be raised to the rank of separate regions, in addition to New Zealand and perhaps Hawaii? In each case, no decisive answer can be given. One can prepare a faunal analysis of all these islands but it shows in each case that the fauna is very heterogeneous. The faunas of these islands consist of a strong endemic element, as well as of immigrant components of various derivation. The same is true for all continental regions that are geographically intermediate between other major continents, as for example North America or the East Indies. A faunal analysis will permit in such cases a much more accurate representation of facts than a regional analysis. Most of the "regions" of the regional zoogeographer coincide anyhow more or less with the major geographic subdivisions of the earth. To say that the bird fauna of North America consists of 23 per cent Neotropical, 46 per cent Nearctic, and 31 per cent Palearctic elements gives a much more accurate picture of the composition of its fauna than to say that the Nearctic Subregion is part of the Holarctic Region. The time seems to have come to revise our zoogeographic classifications on the basis of this new concept. Its application by Stegmann (*Faune d. l' URSS, Oiseaux*, vol. 1, no. 2, 1938) to the birds of the Palearctic Region and by Stresemann (*Jour. für Ornith.*, 87, 1939:312-425) to the birds of Celebes has been extremely fruitful.

American Museum of Natural History, January 21, 1943.

BIRDS OBSERVED BETWEEN POINT BARROW AND HERSCHEL ISLAND ON THE ARCTIC COAST OF ALASKA

By JOSEPH S. DIXON

Early in 1913 an expedition was organized by a group of graduates of Harvard University to visit the Arctic waters of Siberia and Alaska. Through cooperation of John E. Thayer and other friends of the Museum of Comparative Zoology, at Harvard, W. Sprague Brooks and I were able to accompany the expedition as zoological collectors and observers. As originally planned our expedition was scheduled to cover only six months from April to September, 1913. However, the Arctic seas did not thaw out much that summer and our ship was frozen in on September 3, 1913, seven miles off the Arctic Coast of Alaska near Humphrey Point (see map, fig. 13) and we were forced to spend nearly an extra year there. The Arctic ice melted so that our ship was able to navigate again on July 27, 1914, and Point Barrow was reached on the return voyage the following September.

Without adequate food and being forced to devise our own fur clothing, it was questionable at times whether we would survive the Arctic winter, but fortune favored us and all thirteen of us came through without the loss of a man. Because of the real danger that our ship might be crushed at any time by the heavy ice, we began hastily to sled our meager supplies ashore. Since we had no dogs we had to do the sledding ourselves (fig. 14). Winter base camp was established on shore about 35 miles west of the international boundary between Alaska and Canada. From this camp extensive

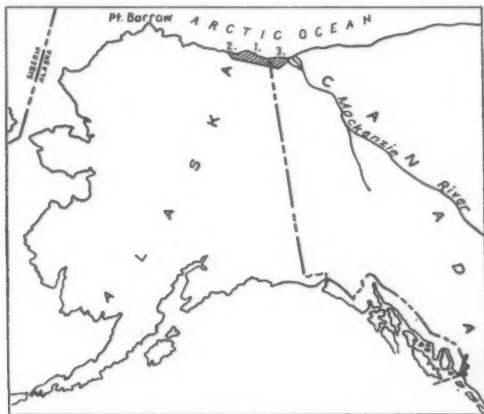


Fig. 13. Outline map of Alaska showing localities mentioned. 1, Humphrey Point and Griffin Point; 2, Collinson Point at Camden Bay; 3, Herschel Island. The shaded section, about 200 miles long, represents the chief area involved in this report.

collecting trips were made as far west as Collinson Point during the winter in February and March, while various members of the party made hunting trips along the coast and back into the foothills. I was fortunate in being able to spend a month, from February 6 to March 6, 1914, with Dr. R. M. Anderson who was in charge of the Southern Division

of the Canadian Arctic Expedition which was wintering at Collinson Point in Camden Bay, Alaska. This was the locality where we had done most of our collecting in August, 1913. It was interesting to compare the winter conditions with those which we had encountered during the previous summer at this place. Dr. Anderson gave me much valuable assistance as did also Messrs. Chipman and Cox and Mr. Hubert Wilkins, who later became famous for his exploration in the Antarctic.

On March 8, 1914, I returned to Humphrey Point and since Mr. V. Stefansson was seeking someone to leave in charge of one of his depots at Demarcation Point, Mr. Brooks and I gladly offered to take care of the supplies. Accordingly, March 13 to



Fig. 14. Ice conditions where ship was frozen in near Humphrey Point. The author is shown sledging supplies ashore, September 10, 1913.

April 30 was spent in the general vicinity of Demarcation Point where Mr. Brooks remained, while on May 1, 1914, I returned to our base camp at Humphrey Point and remained there until July 27 when the ice pack melted enough so that our ship, the "Polar Bear," was again able to navigate.

The period from May 1 to July 27 was exceedingly fruitful because as many as five or six members of our expedition spent considerable time in hunting eider ducks, geese and loons. These made a most welcome addition to our larder because the only fresh meat that we had during the winter consisted of a few hair seals which we had killed and frozen the previous October, augmented by one polar bear which visited our camp and attempted to eat an Eskimo's skin boat and was himself killed and eaten.

I thus had an opportunity to examine many birds which were shot for food which I was unable to save as specimens. Even though I worked from 20 to 24 hours a day, there were times that I was unable to keep up and had as many as 20 to 30 ducks, loons and geese waiting preparation. A few specimens that were preserved disappeared via Eskimo dogs and a good deal of information was recorded in my field note books that is not covered by Brooks in his previously published account as presently explained. However, most of my observations strengthen and support his. I therefore have not attempted to list all species that we collected but only to corroborate and add to previous records.

Knowing that distillate for our engines might be had at Herschel Island, we made that our next objective, reaching there on July 28, 1914. By this time Mr. Brooks,

who had remained at Demarcation Point, arranged to go out on a small vessel, "The Olga," which was headed straight for Point Barrow as soon as the ice pack and a broken but repaired engine shaft would permit. He, therefore, was not with me at Herschel Island and we did not see each other again during the trip. At Herschel Island I found collecting prospects were so bright and I was so kindly received by the Royal Canadian Mounted Police that I decided to remain there while the "Polar Bear" continued on her whaling voyage to Banks Island. This gave me an excellent opportunity to study the bird life at Herschel Island and on the adjoining mainland from July 28 to August 21, 1914. I then rejoined the "Polar Bear" upon her return from her whaling cruise to Banks Island, thus reaching Point Barrow on September 1, 1914, and arriving in California the middle of October, just thirteen months late for my own wedding.

In order to give the reader some idea of conditions that exist inland from Demarcation Point, I have selected a typical spring day, April 22, 1914, when I hiked to the foothills of the Richardson Mountains which lie south of Demarcation Point. According to the Alaskan-Canadian Boundary Survey chart, the nearest spur of these foothills was 12 miles from our camp. It took six hours of hard hiking over the flat snow-covered tundra plain to reach my objective. Here at an elevation of about 700 feet I found that some of the south-facing ridges were just becoming free of snow and a few of the hardy plants were starting to grow amid the sharp black rocks.

One Snowy Owl (fig. 15) and one ground squirrel were the only living animals seen in the course of the entire day. I heard one male ptarmigan give his mating call but this was the only sound that I heard in the 14 hours that it took me to make the round trip. Ptarmigan tracks were numerous along some stunted willow thickets where a stream entered the foothills. During the day I crossed 25 fox trails made in the snow. These red fox tracks were even seen in pairs and the sequence of tracks indicated that the foxes were mating. The season on the southern exposure of these foothills was clearly several weeks earlier than along the ice-bound ocean (see fig. 16) where the thermometer still frequently dropped below zero. The glare of the brilliant sunlight that was reflected from the snow was intense and my face was badly "snow burned" while my ears seemed to sunburn and freeze at the same time.

During the entire trip I collected about 1000 specimen of birds and mammals together with 200 pages of field notes pertaining to them. This material, with the exception of a few skins lost in the field, reached Boston safely but while it was being "worked up" at Boston my field notes were misplaced and were lost for a number of years. There were of course many data in them that were not included by W. Sprague Brooks when he published his "Notes on Birds from East Siberia and Arctic Alaska" (Bull. Mus. Comp. Zool., 59:361-413) in September of 1915. Some ten years later, Dr. R. M. Anderson published the results of his excellent studies of Arctic birds (Volume 2 (Birds and Mammals) of the Canadian Arctic Expedition Reports, 1913-1918).

Since a scarcity of migration and breeding records for the Arctic Coast of Alaska between Point Barrow and the mouth of the Mackenzie River still exists, I have recently gone over my original field notes and selected and compressed into a few pages some additional items and observations that seem to have the greatest value as bearing on nesting and migration of birds along this northeastern coast of Alaska and I present them herewith.

Gavia adamsii. Yellow-billed Loon. A marked migration eastward was noted in June, 1914. The first spring migrant, a female weighing 10 pounds, was collected near Humphrey Point on June 3, 1914. A male collected on June 7, weighed 12 pounds and had a wing spread of 61 inches, a length of 34½ inches, wing of 16½ inches, and bill of 5½ inches. On June 14, 1914, three males, all exceedingly fat and weighing 10, 10¼ and 10¾ pounds, were collected. Close watch was kept and although



Fig. 15. A large female Snowy Owl perched near winter camp at Humphrey Point, November 20, 1913.

five females were collected, I found no positive evidence that they bred along this section of the Arctic coast.

Gavia arctica pacifica. Pacific Loon. Many were noted in migration at Camden Bay on August 9, 1913. The first spring arrival was noted and collected at Humphrey Point on June 3, 1913. On July 26, 1914, at Icy Reef near Demarcation Point I found a nest of this species between two small islands in a tundra pond (fig. 17). The nest contained one incubated egg and was built of coarse sedge and grass stalks that had been bitten off by the bird. It was half floating in 8 inches of water and measured 2 feet across at the base and was six inches high. The egg rested in a slight depression on the top of the nest.

Gavia stellata. Red-throated Loon. At Camden Bay on August 9, 1913, many were observed in migration and the first specimen was collected the following spring on June 13 at Humphrey Point.

Cygnus columbianus. Whistling Swan. Rarely seen. One collected on June 15, 1914, near Humphrey Point had a length of 44 inches and a wing-spread of 73 inches; it weighed only 12 pounds.

Branta canadensis leucopareia. Lesser Canada Goose. As Taverner has pointed out in his "Birds of the Eastern Arctic" (Canada's Eastern Arctic, Department of the Interior, 1934:117) this is the Hutchins Goose of the old A.O.U. Check-list and equals Hutchins Goose of the field notes of Brooks and myself. The first spring arrival was noted on June 1, 1914, when one was shot 12 miles east of Humphrey Point. On June 13, 1914, a flock was seen flying eastward at Humphrey Point. At Herschel Island a flock, all with molting primaries and unable to fly, was noted on August 1, 1914, and a specimen collected there a week later had fresh wing and tail feathers nearly two-thirds grown. Probably breeds in the Mackenzie Delta.

Branta nigricans. Black Brant. On August 16, 1913, a flock of about 100 birds was noted flying westward in fall migration at Camden Bay. The first spring arrivals were noted on Humphrey Point on May 21, 1914. On May 29, 1914, several flocks of brant were seen migrating eastward. On June 1, 1914, single brant and groups numbering up to 75 birds were seen migrating eastward between 7 and 10 o'clock in the morning. Some flocks kept a half mile offshore over the ice and others followed the coast line, while some cut across the tundra inland. The spring migration continued in force until June 13, 1914, when three flocks were seen, all going eastward.

Anser albifrons albifrons. White-fronted Goose. A rare straggler. One was shot 12 miles east of Humphrey Point on June 1, 1914. In size it seemed nearer *albifrons* than *gambeli*, as reported by Brooks.



Fig. 16. View looking out over Arctic Ocean near Demarcation Point on September 1, 1913.

Chen hyperborea hyperborea. Lesser Snow Goose. Several flocks were noted at Camden Bay on August 16, 1913. All were flying westward toward Point Barrow. The first spring arrivals were noted at Humphrey Point on June 1, 1914, when three flocks were noted migrating eastward. I had expected these snow geese would come from the Mackenzie River but instead they came from the direction of Point Barrow.

Anas platyrhynchos platyrhynchos. Common Mallard. One female was shot near Humphrey Point by natives on July 13, 1914. She was the only mallard among several hundred other ducks killed in the locality that season. Her ovaries were undeveloped, indicating the possibility of a non-breeding bird.

Dafila acuta tsitzihoo. American Pintail. Not common. The first spring arrivals were noted at Humphrey Point on May 29, 1914, when a flock of seven was found on an inland tundra pool. We found no evidence of nesting.

Nettion carolinense. Green-winged Teal. A family of seven was seen on August 8, 1914, and two were collected on August 9 in a pond at Herschel Island; these were the only ones noted and they probably were raised near by.

Clangula hyemalis. Old-squaw. An abundant and noisy duck. Several flocks of spring migrants were noted at Humphrey Point on May 25, 1914, going eastward. Bred locally. On July 27, 1913, at Cross Island a pair was collected out of nearly one hundred which were then flightless due to molting of flight feathers. Another collected at Humphrey Point on September 27, 1913, had completed the fall molt.

Polysticta stelleri. Steller Eider. On June 13, 1914, near Humphrey Point, eight were found sunning themselves on the bank of a small tundra pool and a male and two females were collected. On June 17, two pairs were seen trying to find a suitable nest site on the tundra ponds and from later observation I believe they bred there.

Somateria v-nigra. Pacific Eider. Breeds along the coast both east and west of the Mackenzie Delta. First noted on July 31, 1913, near Flaxman Island, when several flocks were seen on ice floes. At Camden Bay on August 16, 1913, flocks were seen migrating westward. At Demarcation Point on August 29, 1913, one adult with six half-grown young unable to fly were seen partly frozen in by new ice, one inch thick, which was then forming daily. Two young loons, also unable to fly, were likewise noted trapped by the ice. On September 27, 1913, at Humphrey Point four young still unable to fly were collected. On October 14, 1913, one flock was seen in an open "lead" of water six miles offshore at Humphrey Point. The last fall migrant was seen at the mouth of the lagoon at Humphrey Point on November 8, 1913.

In 1914, Pacific Eiders arrived on their spring migration during the last week in May. On June 3, one was collected at Humphrey Point that had no black "V" on its throat. On June 17 a pair that had remained about a grassy islet in one of the larger tundra ponds at Humphrey Point showed definite nesting activity. The males were the first to leave on the fall migration. On July 5, 1914, two flocks of 75 birds each, *all males*, were noted migrating westward at Humphrey Point.

Somateria spectabilis. King Eider. The first spring arrivals were found five miles offshore in a small lead of open water in an extensive field of ice at Humphrey Point on May 15, 1914. On May 26, 1914, four were seen flying over the tundra and a breeding male was collected on June 13, 1914, near Humphrey Point. A breeding pair was collected on June 14, 1914. On June 26, 1914, at Humphrey Point I found a female brooding three eggs. The nest was without lining and was placed on a small islet, 2x3 feet in extent, in a quiet secluded tundra pond (fig. 17). The male waited anxiously near the nest until I came within 25 yards before taking flight. The female remained flattened on the nest until I waded within 12 feet of her. The nest was merely a mossy cup sunk in the tundra moss.

On July 2, 1914, I frightened a female from her nest containing six eggs when I fired a shot at a jaeger. I had previously passed within 20 feet of the nest but the duck had crouched low with out-



Fig. 17. View to landward showing tundra ponds; eider ducks and loons nested on small islets shown in center of photograph; Humphrey Point, July 2, 1914.

stretched neck and remained motionless on the nest, thus escaping notice. On June 2, 1914, at Humphrey Point, many flocks of *male* King Eiders were seen migrating westward toward Icy Cape where there are said to be extensive molting grounds. On July 4, 1914, several females were taken, which dissection showed were non-breeding. On July 13, 1914, several hundred King Eiders, *all males*, in flocks of from 50 to 100, were seen flying westward along open leads offshore at Humphrey Point.

Mergus serrator. Red-breasted Merganser. A breeding male was collected at Griffin Point on June 24, 1914, but the species was rare there. At the mouth of Firth River on August 2, 1914, a female was seen piloting her family to safety with one youngster riding on its mother's back.

Buteo lagopus s. johannis. American Rough-legged Hawk. One very gray bird was noted at Humphrey Point on May 13, 1914, and a used nest was found on a steep bank at Herschel Island on August 8, 1914.

Falco peregrinus anatum. Duck Hawk. A single bird was noted at Humphrey Point on July 2, 1914. Another was seen in pursuit of a Semipalmated Sandpiper at Herschel Island on August 2, 1914.

Falco columbarius columbarius. Eastern Pigeon Hawk. One female was collected (J. S. Dixon no. 3485) from the ship's mast when we were in the ice near Demarcation Point on September 1, 1913.

Lagopus lagopus alascensis. Alaska Ptarmigan. The Alaska (Willow) Ptarmigan was abundant in late summer of 1913 at Humphrey Point but it spent the winter inland, returning to the coast again the following April. On August 3, 1913, several families of ten to fourteen half-grown young were found at Camden Bay. Near Demarcation Point on September 1, 1913, several of these ptarmigan shot were molting into the white winter plumage but still had brown backs. By September 27, 1913, they had collected into large flocks and by October 15 they were all pure white and were not seen again on the coast until March 3, 1914, when the thermometer registered 46° below zero. The first spring arrivals were noted at Demarcation Point on April 6, 1914. These ptarmigan seemed to be aware that the broken cakes of sea ice were their safest hiding and roosting place through April be-

cause they then left the tundra at night and roosted in holes dug in snow-filled cavities out in the broken ice. On April 17, 1914, two ptarmigan out of twenty-five shot had brown feathers coming in on the tops of their heads. The combined weight of the twenty-five birds shot was 35 pounds. Ptarmigan were a most important food item after a winter of fresh meat starvation. By May 13, 1914, at Humphrey Point, the males were in full breeding plumage. They cackled and strutted about like diminutive turkey gobblers. From far and near their calls were heard over the snowy plain between the sea coast and the foothills. On May 20, 1914, I found one old cock with a harem of six hens. No other males could be found near and it appears that one cock may thus breed with several hens. A female taken for a specimen on June 19, 1914, had 57 beetles which formed one-fourth of her crop contents, the other three-fourths consisting of green willow leaves. On June 27, 1914, a ptarmigan nest containing 11 eggs was found four miles inland from Humphrey Point but these eggs were all destroyed by a jaeger before they hatched.

Lagopus rupestris kelloggae. Kellogg Ptarmigan. These ptarmigan were found in rolling foothills at Camden Bay on August 3, 1913. On September 1, 1913, near Demarcation Point, ten that were shot were in almost complete winter plumage. The following spring by May 12, 1914, they were common near Humphrey Point where dark patches of tundra free of snow occurred near the beach and adjacent to patches of creeping arctic willows upon which these ptarmigan fed. On July 4, 1914, near Humphrey Point a pair of these birds was collected amid grass-grown drift wood practically on the beach. They were then in full summer plumage.

Grus canadensis canadensis. Little Brown Crane. The first spring arrivals were seen May 17-18, 1914, at Humphrey Point. They were heard calling on June 13, but they were rarely seen after that date.

Pluvialis dominica dominica. American Golden Plover. A rather rare breeder. The first spring arrival was noted at Humphrey Point on June 3, 1914. The last fall migrant was noted at Herschel Island in a dry creek bed on August 1, 1914.

Squatarola squatarola. Black-bellied Plover. A female was seen on August 3, 1913, at Camden Bay and flocks of from seven to twenty were seen there on August 9, 1913. The first spring arrival (J.S.D. no 3622 ♂) was seen and collected at Humphrey Point on June 3, 1914.

Arenaria interpres morinella. Ruddy Turnstone. One was collected on August 13, 1913, at Camden Bay. The first spring arrival was noted at Humphrey Point on June 8, 1914. On June 28, 1914, two pairs in breeding condition were collected 12 miles inland along a river bed.

Phaeopus hudsonicus. Hudsonian Curlew. The only one seen was noted at Humphrey Point on June 10, 1914, when it flew by low just over my head.

Tringa solitaria solitaria. Eastern Solitary Sandpiper. Rare. The one female I collected at Humphrey Point, June 1, 1914, upon dissection showed no immediate signs of laying.

Pisobia melanotos. Pectoral Sandpiper. First noted and collected on August 3, 1913, at Camden Bay. By August 9, 1913, many had departed on their fall migration. The first spring arrivals at Humphrey Point were seen on May 23, 1914, when three were collected and four others noted. By June 13, 1914, they were in full nuptial flight and on June 17, 1914, three pairs were seen mating and nesting but were much less in evidence on June 23. At Herschel Island the first fall migrants were noted leaving on August 9, 1914.

Pisobia bairdii. Baird Sandpiper. On June 26, 1914, six were seen and one was flushed from a nest containing three fresh eggs which were laid in a little depression in the tundra without any protection or shade. On July 11, 1914, at Humphrey Point a nest containing four well-incubated eggs was found on open dry tundra. At Herschel Island on July 28, 1914, many immature birds, some with natal down still on their heads, were noted.

Pelidna alpina sakhalina. Red-backed Sandpiper. Rare. At Humphrey Point, June 15, 1914, I collected a female with an egg ready to lay in her oviduct. On July 4, 1914, four were seen on the tundra at the same locality.

Limnodromus griseus scolopaceus. Long-billed Dowitcher. Rare. Two, the only ones seen and collected were with Pectoral Sandpipers at Herschel Island on August 20, 1914.

Micropalama himantopus. Stilt Sandpiper. The only ones I saw were three collected on August 2, 1914, at Herschel Island.

Ereunetes pusillus. Semipalmated Sandpiper. Common breeder. At Camden Bay many were seen leaving on the fall migration on August 9, 1913. The first spring arrival was noted on May 24, 1914, at Humphrey Point and the first nest with eggs was found there on June 13, 1914. Another nest containing four fresh eggs was found in a little tuft of grass on a slight ridge of dry tundra on June 19. On June 21, 1914 "skim" ice remained on the ponds all day and the brooding sandpipers stayed on their nests all day. The first brood of four downy young (still wet) was discovered at 10 a.m. on June 30, 1914. On July 1, when the skim ice did not thaw out until 1 p.m., the young ran about foraging actively on insects but were hovered by their parents at five-minute intervals. On July 26, 1914, at Icy Reef young ready to fly were noted with their parents.

Crocethia alba. Sanderling. Several were seen and two specimen collected at Demarcation Point on September 1, 1913.

Phalaropus fulicarius. Red Phalarope. Common breeder. On July 31, 1913, twelve were seen near Flaxman Island, and on August 9, 1913, many were found on tundra pools at Camden Bay. The first spring arrivals, a pair, were taken on June 3, 1914, at Humphrey Point. By June 13, many females were courting males. On June 27, 1914, a nest with four eggs was found. The eggs were placed in a little depression amid green sedges that had sprung up in a partly dry pond. The female flushed when I came within 10 feet of her. Another pair was seen daintily picking small insects off of sedges that were just growing out of the water. By the last of June, Red Phalaropes were growing scarcer and Northern Phalaropes increasing at Humphrey Point.

Lobipes lobatus. Northern Phalarope. The first spring arrival was seen at Humphrey Point on June 11, 1914, but this species was not as common as the Red Phalarope. The first nest, containing three eggs, was discovered on June 20, 1914, and on June 27, 1914, a nest containing four eggs was found. This nest was completely protected from above by overlapping grass and entrance was gained



Fig. 18. Male Northern Phalarope hovering brood of three chicks; Griffin Point, July 13, 1914.

through a little tunnel in the grass at one side. A brood of four downy young was found on July 8, 1914; they were paddling about in a shallow tundra pond. The yellowish green stripes of their backs blended perfectly with the yellow grass as they flattened out on my approach. These young phalaropes are excellent swimmers and walkers, being superior to young sandpipers of comparable age. Their father fluffed out his breast feathers and hovered all four young at frequent intervals. The female did not hover the young at all, being away part of the time, whereas the male parent once allowed me to pick him up while he was hovering three chicks (fig. 18).

Stercorarius pomarinus. Pomarine Jaeger. Not common. The first spring arrival was noted between Griffin Point and Humphrey Point, May 24, 1914, when one (J.S.D. no. 3564) was collected.

Stercorarius parasiticus. Parasitic Jaeger. Several were seen on August 3, 1913, at Camden Bay. The first spring arrival was noted at Humphrey Point, May 30, 1914.

Larus hyperboreus. Glaucous Gull. The first spring arrival was seen at Humphrey Point on May 14, 1914. Young were found and one collected on August 1, 1914, on a low sandpit at the mouth of Firth River.

Pagophila alba. Ivory Gull. Rare. Although I spent many days offshore on the ice, I saw and preserved but one of these birds which was caught by an Eskimo in a steel trap the last week of November in 1913 about five miles offshore from Humphrey Point. This frozen bird measured: wing, $12\frac{3}{4}$; bill, $1\frac{1}{16}$; tarsus, $1\frac{1}{8}$ inches; and it had pure white plumage and black feet.

Xema sabini. Sabine Gull. Rare. The first spring arrival was seen and collected at Humphrey Point on June 3, 1914. Another was taken there on June 13, 1914.

Sterna paradisaea. Arctic Tern. Not common. Six were seen on July 31, 1913, at Camden Bay. The first spring arrival was noted at Humphrey Point on May 29, 1914. A few were found nesting on a low sandpit at the mouth of the Firth River on August 2, 1914.

Nyctea nyctea. Snowy Owl. Regular resident. One was seen on August 4, 1913, at Camden Bay and one remained about our camp during most of December of 1913. One was seen on April 22, 1914, 12 miles southwest of Demarcation Point. On May 26, 1914, at Humphrey Point one Snowy Owl was seen watching for lemming mice. On June 1, 1914, there was a well defined migration of these owls. Seven were seen between 4 a.m. and 7:30 p.m. flying eastward singly along a crack in the sea ice 100 yards offshore at Humphrey Point. On June 7, 1914, one tried to carry off an Old-squaw Duck that had been crippled.

Asio flammeus flammeus. Short-eared Owl. The first spring arrival was seen at Humphrey Point on May 20, 1914, and one was seen there watching for lemmings on May 26, 1914. A male collected on June 13 was ready to breed.

Otocoris alpestris arcticola. Pallid Horned Lark. The first spring arrival, a male with testes the size of sweet pea seeds, was collected at Humphrey Point on May 7, 1914. I did not see the species again until a flock of eight was encountered on August 9, 1914, at Herschel Island.

Perisoreus canadensis fumifrons. Alaska Jay. A straggler, many miles from timber, came aboard the ship "Elvira" when it was stuck fast in the ice offshore from Demarcation Point on the first of September, 1913.

Corvus corax principalis. Northern Raven. A widely distributed but sparse resident. Ravens were not seen by us in the winter along the sea coast. On April 28, 1914, when a flock of 40 ptarmigan was hunted, they flew out and attempted to hide amid the broken salt ice cakes 100 yards offshore. As soon as the ptarmigan flock flew, a raven came sailing in from a distance and made repeated attempts to seize a ptarmigan with his bill, causing the flock to scatter like frightened quail. The raven swooped so vigorously at the ptarmigan that I first thought it was a hawk. A pair of ravens was seen at Humphrey Point on May 12, 1914. A raven shot by an Eskimo in the Endicott Mountains in April measured in inches: length, $24\frac{1}{2}$; tail, 10; wing, $17\frac{1}{2}$; tarsus, 3; bill, 3 (measured by me May 29).

Anthus spinoletta rubescens. American Pipit. Two male pipits were collected along the margin of a melting snow bank at Herschel Island on August 9, 1914.

Dendroica magnolia. Magnolia Warbler. A rare straggler. I obtained a single specimen, an immature, judged by the skull; it was picked up dead, apparently from cold and exhaustion, on the sea ice about one mile offshore from Humphrey Point on October 1, 1913.

Acanthis hornemanni exilis. Hoary Redpoll. On August 3, 1913, at Camden Bay I saw and collected an immature bird. On October 1, 1913, another specimen was collected from the ship's rigging when the ship was frozen in the ice off Humphrey Point. The first spring arrivals were noted at Humphrey Point on May 13, 1914, when a flock of ten was seen amid dwarf willows along a creek. On June 27, 1914, a female was collected there; it had an egg in the oviduct that was nearly ready to lay.

Junco hyemalis hyemalis. Slate-colored Junco. Rare straggler. The only one I observed during the entire trip was collected while it was feeding amid some driftwood on the beach near Griffin Point on October 1, 1913.

Spizella arborea ochracea. Western Tree Sparrow. A rare straggler. The only one seen was a young bird caught in a mouse trap at the mouth of Firth River on August 1, 1914.

Calcarius lapponicus alascensis. Alaska Longspur. An abundant breeder. The first spring arrivals, two males, were seen at Humphrey Point on May 18, 1914, but they were common there by May 24. They ceased singing about 10:30 p.m., roosting in the tall grass until 2:30 a.m. A nest containing five eggs was found on June 17, 1914. This nest was placed in a tussock of grass on dry tundra. On June 22, 1914, a nest containing six incubated eggs was found. Five young from the first nest were all able to leave on June 25. These young could fly 50 yards at a time on June 27. On July 30, 1914, I found that the adult longspurs were all difficult to flush because they were molting so fast that they scarcely could fly. A fully-fledged immature specimen was collected on August 9, 1913, at Camden Bay.

Plectrophenax nivalis nivalis. Eastern Snow Bunting. A common breeder. The first spring arrivals, a pair, were seen at Humphrey Point on May 1, 1914. Buntings were common there by May 7. On June 14, 1914, at 8 a.m. a female began building a nest in a fold of our canvas roof. The base and exterior of the nest were composed of roots and wet grass carried 100 yards. The walls of the nest were made of fine grass and lined with duck feathers. Trips for material averaged two to three minutes. The male did not assist. This nest was completed at 10 p.m. that evening, fourteen hours from starting time and the first egg was laid the following morning. On June 17, a female was found incubating three eggs in a nest wedged in a narrow frost crack in a cut bank. The male roosted in another crack near by. Most nests contained four or five eggs. The young developed rapidly; all of them had left the nest by July 30 at which date the adults were in the midst of the annual molt. Two immatures were seen on the wing at Camden Bay on July 27, 1913. One immature was collected there on August 3, 1913, and seven were last seen flying eastward in migration at Humphrey Point on September 27, 1913.

United States Fish and Wildlife Service, Berkeley, California, January 30, 1943.

OBSERVATIONS ON THE MONTANA HORNEO OWL

By CLARK E. HOLSCHER

On March 10, 1941, a pair of Montana Horned Owls (*Bubo virginianus occidentalis*) was found nesting in a large stack of baled hay which was being used as supplemental cattle feed (fig. 19). This hay stack was situated at a winter camp about six miles south of Miles City, Montana. All through the winter a man had occupied the cabin which was about 30 feet from the hay stack. Hay was fed from the stack from the first of January until the middle of April.

The owls were almost undisturbed until about March 20, when removal of hay from the south side of the stack began. At that time a bale was removed near the entrance to the nest and the nesting bird came out of the stack with a great deal of commotion and hissing. The nest was back in the stack so far it could not be seen from the opening from which the bird emerged. On March 25, the actual location of the nest was discovered, but too late, for the bale upon which the nest was resting was inadvertently removed and the nest destroyed. It was about two feet in and about four feet to the right so that the owls had to travel about six feet through the stack to reach the nest. Three eggs fell to the ground when the nest was destroyed.

After losing this first nest, the pair immediately nested again, this time directly on the top of the hay pile where there was no protection at all. Two eggs were laid in this



Fig. 19. Stack of baled hay in which Montana Horned Owls nested. Author is pointing to location of nest of 1942.

nest and after about four weeks one owlet was hatched. The other egg failed to hatch and was kicked out of the nest in a few days by the old owls. The young bird remained on the nest until early June, after which time no regular observations were made. The parent birds and the young one were seen occasionally in this vicinity throughout the summer months, however.

Two owls, presumably the same pair, returned to the hay stack in the spring of 1942. They were nesting when I first returned to the camp on March 16. The nest was

on the south side of the stack, open to the south, but back between two bales so that it was protected on all other sides. Over the top was a ledge of old hay which had been strewn over the stack to protect the baled hay from the weather. Hanging down in front of the nest were several pieces of heavy wire which had been used to keep the loose hay from blowing from the top of the stack. Upon approaching and leaving the nest, the birds had to worm through this wire entanglement.

Two eggs were laid in this nest. They were first seen about March 20. All through the incubation period there was considerable cold and snow which made almost constant protection of the eggs necessary. On one occasion, however, a horse was tied at



Fig. 20. Young owls, one month of age, in nest in hay stack.

the south side of the stack and the nesting bird was flushed. The presence of the horse kept her from returning because each time she would appear the horse would become nervous and the owl would be frightened away. The day was cold and raw, probably 15 to 20 degrees above zero, and the eggs were left exposed to those conditions for 30 to 45 minutes. They apparently suffered no damage, however, for both eggs hatched on or about April 17.

As the incubation period progressed, the parent owls became more and more hostile when disturbed and after the owlets appeared they were ready and willing to fight to protect their young. The nesting site was about 30 feet back from a high bank along the creek. Down in the creek was a small cottonwood tree and crossing the creek near by was a Forest Service telephone line. While one of the pair was on the nest, the other was usually perched in the tree or on a telephone pole. If the nesting bird was flushed from the nest, the other would immediately come to his or her aid. Both would sit near by and hoot and clack their beaks or would fly near the nest, keeping a close watch on all activities. After the young were hatched, the parent birds often would attack intruders.

When the young were one month old, a companion and I set about taking pictures

of them in the nest. One of the old birds flushed from the nest as my friend started up the hay stack and the other bird left the cottonwood tree. This latter bird headed straight for him. As quickly as possible, I thrust a hay fork into the air, deflecting the flight of the bird sufficiently to save my companion from a stout blow on the head. Even so, he could feel the air movement from the large wings as they passed by. We had with us an average-sized cocker spaniel. Every time the dog turned his back, one of the old owls would attack him, nearly knocking him to the ground. Each time, the dog was so surprised that he made no attempt to fight. The owls seemed to throw their weight against him rather than try to tear his hide with their talons.

There was always considerable hooting and clacking of beaks. One bird, presumably the female, made short choppy sounds, *hoo hoo hoo hoo hoo*, while the other would make longer, more extended sounds, *hoooo-- hooooo--*. In addition, one of the birds would fly into the creek bottom, feigning injury, and at the same time make a loud whistling sound. If this bird were approached, it would flutter off, away from the nest, and continue the performance, attempting to lead the intruder from the nesting site. On one such occasion, however, the owl was forced to take to the cottonwood tree when it was viciously attacked by a male Chinese pheasant. The owl made no attempt to fight back but merely flew into the tree.

As stated earlier, the young birds were hatched on or about April 17. They grew rapidly, and by May 1 the old bird had to sit out on the edge of the nest to make room for them. Figure 20 shows the birds at one month of age. They were very downy, but the juvenal feathers were beginning to show in the tail and wings. The feathers were still enclosed in sheaths.

The young birds left the nest at five weeks of age, still fuzzy and downy. However, they were able to fly as far as 100 feet when they were six weeks old. Possibly they left the nest at this tender age because of the many disturbances to which they had been subjected. They were last seen at two months of age, the young birds sitting on the platform of the windmill tower and the old owls on telephone poles 100 yards away.

In and around the nest were the remains of many rodents, mostly rabbits. In 1942 no bird remains were found, but in 1941 there was evidence that a few small birds had been killed and eaten. It is not likely that birds made up a large part of the owls' diet.

Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Montana, December 16, 1942.

AN ECOLOGICAL STUDY OF NESTING BIRDS IN THE VICINITY OF BOULDER, COLORADO

By VERNA R. JOHNSTON

During the summer of 1941, while doing biological field work in the Rocky Mountains west of Boulder, Colorado, I became interested in the distribution of birds as related to life-zones. Many Colorado birds are listed in ornithological manuals as characteristic of particular zones. I determined to investigate whether their nesting sites were chosen because of the altitude and zone or because of local habitat conditions.

This study was made at Science Lodge, the University of Colorado biological station, at an elevation of 9500 feet in the mountains twenty-eight miles west of Boulder, and covered a five weeks' period, July 21 to August 22, 1941. In this time I attempted to discover all the nests possible by covering the area in and around the biological station, and by censusing all regions, from the plains to above timber line, that were visited by the class field trips made on three days of each week. In addition, I obtained authentic records and descriptions of nests from two naturalists of the Rocky Mountain National Park and from several members of Science Lodge. It was my intention to analyze the nests, nest environment, and vegetation and to determine, after a study of many nests, whether life-zone or local habitat conditions appeared more important in the selection of nest sites.

This paper is inconclusive, but it is hoped that the data may make a contribution to the broad topic of life-zones and bird distribution.

LIFE ZONES

Before discussing the data, it seems advisable to summarize briefly the life-zones in Colorado, in order that each zone may be defined clearly in the reader's mind when mentioned in this paper. The altitudinal limits given for the zones are those in the region near Science Lodge.

Five life-zones are represented in Colorado. (1) The Upper Sonoran, or Plains zone, below 6000 feet, is characterized chiefly by narrow-leaved cottonwoods and willows along streams, herbs such as yucca, prickly poppy, and prickly pear; and rattlesnakes. (2) The Transition, or Foothills zone, 6000-8500 feet, is the zone of yellow pine (*Pinus ponderosa*) predominantly, with Douglas fir (*Pseudotsuga mucronata*) and Colorado blue spruce (*Picea pungens*) abundant in moist areas. (3) The Canadian zone, 8500 to 10,500 feet, is the zone dominated by the lodgepole pine (*Pinus murrayana*), with aspen (*Populus tremuloides*) and sub-alpine fir (*Abies lasiocarpa*) groves abundant; it is invaded in its lower limits by yellow pine and in its upper by Engelmann spruce (*Picea engelmanni*) and sub-alpine fir. (4) The Hudsonian zone, 10,500 feet to timber line, is the region of moist dense forests of Engelmann spruce and sub-alpine fir, extending up through timber line. (5) The Arctic-Alpine zone covers the area above timber line, usually 11,500 feet and up, characterized by dwarf willows and numerous low-growing herbs and shrubs.

There is little question that in many regions Colorado shows life-zones, as indicated by vegetation, very clearly, but it must be admitted that "birds are naturally less restricted to zones than mammals and plants, and in the field the question of correlating them to zones is rendered difficult by the modifying conditions which complicate the zones themselves" (Bailey, 1921:xxxvi). A complicated life-zone situation was in evidence near Science Lodge in a ravine called Little Royal Gorge: here, in one small

area, were trees representative of three zones. An ecological study of this area ended with the conclusion: "It is evident from this study that plants typical of many altitudes and habitats can grow in close proximity to each other where the topography furnishes the proper conditions as it does in Little Royal Gorge" (Crumpacker, 1939). Another area, Lakewood, within thirty minutes' drive of the station, presented an unusual habitat. Along a creek at Lakewood were found narrow-leaved cottonwoods, alders, Colorado blue spruce, lodgepole pine, limber pine, and Engelmann spruce, representative trees of the Transition, Canadian, and Hudsonian zones, respectively, all growing together in a relatively small area at an elevation of 8500 feet. These two instances, and others like them, definitely complicate the life-zone picture, but the life-zone concept stresses them as the exceptions which prove the rule and claims that in most regions of the Rockies life-zones are clearly marked by vegetation, particularly trees. It is not the purpose of this paper to discuss the validity of life-zones, but to determine whether bird distribution correlates with them as they have been described above, or with local habitat.

On the basis of bird distribution, Betts (1913) stated that it was difficult to recognize more than two zones between plains and tundra. He suggested that the bird life-zones be classified as follows: (1) Plains, (2) Yellow Pine, (3) Mountain (including Canadian and Hudsonian), and (4) Tundra. Alexander (1937) agreed with this zonation and went further to say: "Actually bird distribution seems to be less a matter of altitude *per se* than of habitat preference, and before we can pass judgment upon the desirability of recognizing two zones in the higher forested portions of the Rockies we must collect more data of a statistical nature on the bird communities." Alexander later in this same work remarks: "It seems evident that birds are more influenced in a choice of nesting habitat by purely local conditions than by what we might call geographic conditions. A statistical field study of birds during the nesting season should help determine the nature of this choice, and whether or not the conclusions drawn from unorganized observations are justified." It is this type of statistical field study which I have made, and my data point to several possible conclusions.

NEST TOTALS

Nests, or records of nests, were obtained for thirty-three species of birds and reached a total of one hundred and two nests. The species are listed below, along with numbers of nests found.

Red-tailed Hawk (<i>Buteo borealis</i>)	1
Spotted Sandpiper (<i>Actitis macularia</i>)	2
Avocet (<i>Recurvirostra americana</i>)	2
Nighthawk (<i>Chordeiles minor</i>)	1
Broad-tailed Hummingbird (<i>Selasphorus platycercus</i>)	5
Red-shafted Flicker (<i>Colaptes cafer</i>)	2
Red-naped Sapsucker (<i>Sphyrapicus varius</i>)	5
Western Flycatcher (<i>Empidonax difficilis</i>)	6
Empidonax Flycatcher (<i>Empidonax</i> sp.)	1
Western Wood Pewee (<i>Myiochanes richardsonii</i>)	2
Olive-sided Flycatcher (<i>Nuttallornis mesoleucus</i>)	1
Horned Lark (<i>Otocoris alpestris</i>)	1
Violet-green Swallow (<i>Tachycineta thalassina</i>)	3
Barn Swallow (<i>Hirundo erythrogaster</i>)	1
American Magpie (<i>Pica pica</i>)	15
Mountain Chickadee (<i>Penthestes gambeli</i>)	1
White-breasted Nuthatch (<i>Sitta carolinensis</i>)	1
Brown Creeper (<i>Certhia familiaris</i>)	1

Dipper (<i>Cinclus mexicanus</i>)	4
House Wren (<i>Troglodytes aëdon</i>)	2
Robin (<i>Turdus migratorius</i>)	11
Hermit Thrush (<i>Hylocichla guttata</i>)	2
Mountain Bluebird (<i>Sialia currucoides</i>)	4
Townsend Solitaire (<i>Myadestes townsendi</i>)	2
American Pipit (<i>Anthus spinoletta</i>)	4
Warbling Vireo (<i>Vireo gilvus</i>)	2
Audubon Warbler (<i>Dendroica auduboni</i>)	1
Western Meadowlark (<i>Sturnella neglecta</i>)	1
Red-winged Blackbird (<i>Agelaius phoeniceus</i>)	7
Green-tailed Towhee (<i>Oberholseria chlorura</i>)	2
Gray-headed Junco (<i>Junco caniceps</i>)	7
White-crowned Sparrow (<i>Zonotrichia leucophrys</i>)	2
Total	102

ECOLOGY OF THE NESTS

Each species for which two or more nests were found is discussed individually, with the exceptions of the Spotted Sandpiper and Red-winged Blackbird, where details of nests were lacking.

Avocet.—The Avocet is a bird of the plains region, being found as a summer resident at prairie ponds. Avocets were discovered nesting at a small prairie pond near Fort Collins in 1940, at 5100 feet, and at a large pond near Boulder, 5300 feet, in 1941. This species is confined to the Upper Sonoran zone, but it occurs only in the parts of that zone where local nesting conditions are suitable.

Broad-tailed Hummingbird.—Below is listed the plant cover in which each of the five hummingbird nests was found, and the elevation.

Sub-alpine fir	10,000 feet
Lodgepole pine	9,500
Jamesia	8,300
Alder	8,100
Douglas fir	8,100

The Broad-tailed Hummingbird is found in the summer from plains to timber line, and according to Kleinschmitz (1939), "these birds nest earliest on the plains and in the lower foothills, and as the season progresses they migrate gradually to higher altitudes following the profusely blooming wild flowers. For this reason they are able to nest again in a higher zone." Total zonal changes undoubtedly bring about their migration, but the added flower nectar in each local habitat is the bird's immediate target. The zone in which a later blooming season occurs indirectly affects each habitat in it, but the items of importance to the bird are (1) whether or not food is available locally and (2) whether or not suitable nest sites are present. These two conditions are apparently met in any of four zones.

Red-shafted Flicker.—The flicker breeds from plains to timber line, usually selecting nest sites in dead trees. The two nests found were located in cavities in dead trees, one eighteen feet off the ground at 9400 feet, and the other in the open top of a fifteen-foot tree at 10,500 feet. Nest sites are apparently determined by local conditions, as altitude does not restrict the flicker.

Red-naped Sapsucker.—This is a species on whose nest site all Colorado bird authorities seem to agree. The Red-naped Sapsucker always excavates a hole in an aspen, usually a live one, and rears its family therein. The five nests I recorded were in live

aspen trees in groves at elevations of 8600, 8800, 8800, 9000, and 9900 feet. Since the bird's breeding is confined to aspens and since aspens grow chiefly in the upper Transition and Canadian zones, the Red-naped Sapsucker is found principally in those zones. Yet it is found breeding only in the parts of those zones where aspens grow, so that local conditions must be important in nest selection.

Western Flycatcher.—The Western Flycatcher seems to be adapting itself to the ways of human beings. Six nests of this species were recorded, some from 1941 and some from previous years, and all were in or on buildings. One brood was reared in late July of 1941 on a rafter under the eaves of the laboratory building at Science Lodge, in full view of students studying in the laboratory. In 1940 a nest was built on a rafter in the sawmill in camp and brooded successfully, undisturbed by men working in the mill daily. Another nest in 1940 was built on a rafter inside the boiler room, the door of which was always left open, and the bird flew in and out at will; a nest under the front porch of a building has been used yearly since 1935. In 1940 a Western Flycatcher built a nest on a two-by-four above the window inside a cabin which was unoccupied for the first two weeks of camp and the door of which stood open. When the cabin had to be used, the bird refused to leave and stayed until the nest and eggs were forcibly removed and the door shut. In 1941 a nest of this species was discovered on a rafter inside a barn at 9800 feet elevation. I have no records of Western Flycatcher nests to compare with these from the Science Lodge vicinity, but according to Betts (1913), the birds breed from 8500 to 10,000 feet, and the nests formerly were placed on rocky ledges or the sides of prospect tunnels. It is interesting to observe their apparent preference for buildings as nest sites. They appear to occur solely in the Canadian zone, but my data are insufficient for a definite statement.

Wood Pewee.—Two records were obtained for the Wood Pewee, a nest at 8800 feet, and a nest in a yellow pine at 8200 feet. Kleinschultz (1939) states that the bird is "found mainly among the ponderosa pines on the open hillside," but Alexander (1937) and Sclater (1912) list it as breeding from the plains to 10,000 feet. The author has observed the Wood Pewee on the plains, in ponderosa pines, and above 10,000 feet, and feels that its range is wide. The data are insufficient to prove any point except that the bird does nest around 8500 feet; it may nest above or below as well.

Violet-green Swallow.—Three nest records were obtained for this species, two nests constructed under the eaves of buildings at 8200 and 8400 feet, respectively, and one nest "in the cavity of a sheet metal Kodak sign on the main street of Estes Park, Colorado" (Rodeck, 1941). These birds breed from the plains up to 10,000 feet (Alexander, Kleinschultz, and Sclater), and apparently are commencing to make use of crevices and crannies around human buildings as nest sites more than previously. They are not restricted by zone or by habitat; and they appear to utilize many types of local situations in nesting.

American Magpie.—Fifteen nests of the American Magpie were found, eleven in willows at 5000 feet, two in narrow-leaved cottonwoods at 5300 feet, and two in narrow-leaved cottonwoods at 8500 feet at Lakewood. All were along streams. These records seem to indicate that magpies in this section of Colorado prefer willows and narrow-leaved cottonwoods near water for nest sites. Sclater (1912) mentions this preference. These two trees are found chiefly in the plains region, but extend into the foothills as stream-side members. Willows occur higher, but not as large trees bordering streams. Lakewood, at an elevation of 8500 feet, might be classed as in either the upper Transition or the lower Canadian zone, but this is insignificant. The important fact is that a thick stand of narrow-leaved cottonwoods is present there, and because magpies prefer

them with the stream beside them as nest sites, they nest there. They appear to select their nests for local habitat reasons, not because of zone or altitude.

However, there is an indirect relationship between these two apparently opposite factors. The suitable nest sites, dependent on local habitat, occur only in certain zones, because the willows and cottonwoods as large stream-side trees, grow commonly only on the plains and in the foothills. Thus, the nesting occurrence of the magpie is determined directly by local habitat conditions and indirectly by altitude and zone.

Dipper.—Four nests of the Dipper were recorded, two at an elevation of 9400 feet, one at 7500 feet, and one in Boulder at 5300 feet. The nest at Boulder was situated under a bridge on Broadway; the nest at 7500 feet was placed on a sloping rock ledge six feet above water; the third nest was placed on a rock behind a curtain of water at Arapahoe Falls; and the fourth in a rock fracture at Alberta Falls. These data indicate in a small way a point on which all Colorado bird authorities are agreed concerning the Dipper: it occurs from 5000 feet to timber line! This is a species which, perhaps more definitely than any other, breeds in a spot determined by habitat, utterly regardless of life-zone and altitude. The "Water Ouzel" is always found along rushing mountain streams. These turbulent waters and scattered boulders alone meet its nest site requirements, and by these streams the Dipper nests, no matter what the altitude. Its nest site is determined solely by habitat conditions.

House Wren.—This species is restricted by neither zone nor habitat. It is found breeding from the plains to timber line, although Kleinschnitz records it as most common around 8500 feet. It has been known to nest in deserted cabins, empty fruit cans, under logs, in old woodpecker holes, between logs of miners' cabins, and in all sorts of places. I recorded two nests, one from an old woodpecker hole in an aspen at 9000 feet, in the same tree as a Red-naped Sapsucker nest, and one in Moraine Park at 8500 feet.

Robin.—The Robin has a wide breeding range, nesting from the plains up to timber line and showing no limitations in choice of nesting site. Of the eleven nests found, three were in narrow-leaved cottonwoods at 8500 feet, one in a willow at 8400 feet, one in a Douglas fir at 8800 feet, one in a lodgepole pine at 9500 feet, one on a rafter of a Science Lodge cabin at 9500 feet, one in an aspen at 9500 feet, one in a limber pine at 10,500 feet, and one at 10,800 feet. I was unable to secure a nesting record from below 6000 feet, but Betts and Alexander in their surveys of the birds of Boulder County both list the Robin as a species nesting on the plains, as well as in all zones except the Alpine.

Hermit Thrush.—The Hermit Thrush is recorded by most Colorado bird writers as nesting commonly from 8000 feet to timber line. This species nested on a rafter under the roof of a building at Science Lodge in 1936. In 1941, a nest containing eggs was discovered in a limber pine about six feet off the ground at an elevation of 11,000 feet on Mount Niwot. The bird appears not confined to any zone and probably selects its nest site according to local conditions, although the nest sites may vary considerably.

Mountain Bluebird.—The Mountain Bluebird breeds from the plains to timber line. (Betts, 1913; Alexander, 1937). My four records show one nest in an aspen at 9000 feet, and three in dead trees at 10,800, 11,000, and 11,300 feet. "A few nest on the creek bottoms and about the prairie towns, later to ascend into the hills with the growing abundance of insect life. In this way, a second brood is often raised, and it is not unusual to find them nesting in July in the wind-twisted trees of timberline" (Kleinschnitz, 1939). The nest observed at 11,000 feet had young birds in it on July 31, and the nest at 11,300 feet had three young on August 6. These birds appear wide-ranging, choosing nest sites according to local conditions, regardless of altitude.

Townsend Solitaire.—This species constructs an interesting nest, always a bulky, untidily thrown-together affair of sticks on the outside and lined with grasses within. The two nests found were placed on the ground on a steep slope, one under an overhanging rock, and one in a pothole, under overhanging roots; both of these nests were at a 9000-foot elevation. This bird, according to Sclater, Betts, and Alexander, breeds from 7000 feet to timber line. It seems not restricted by zone or altitude, nesting entirely according to suitable local habitat conditions, which appear to include a slope as essential to the site of the nest.

American Pipit.—The pipit is a bird which definitely breeds only above timber line! My four nest records were from elevations of 11,300, 11,500, 12,000, and 13,100 feet. This species is characteristic of the Arctic-Alpine zone, and probably occurs there because suitable nesting sites are present there alone. "The pipit confines itself to one nesting habitat, preferring the grassy slopes of the Arctic-Alpine region" (Kleinschnitz, 1939). Grassy slopes occur in other zones, but they are not like the grassy slopes above timber line. The bird seems restricted to this zone by its own local nest requirements.

Warbling Vireo.—The Warbling Vireo has been recorded from the plains to 10,000 feet, and is considered by Sclater, Betts, and Kleinschnitz to breed most commonly in cottonwoods and aspens. The two nests found of this species were in aspens, one at 8200 feet and the other at 9000 feet. Since this vireo seems to prefer these two as nest sites, it apparently confines itself to regions where they occur. Cottonwoods grow on the plains and in the lower Transition, and aspens are numerous throughout the Canadian zone. Thus the Warbling Vireo's breeding range is determined by its habitat requirements; it seems to nest in any part of these three zones where aspens or cottonwoods are found.

It is not an uncommon occurrence for a Warbling Vireo to sing while sitting on the nest. This was observed by Alexander, two biology students, and the writer at the nest discovered at 9000 feet near Little Royal Gorge in early July, 1941.

Green-tailed Towhee.—Two nests of the Green-tailed Towhee were found, both on the ground and well hidden. One was situated amid creeping juniper at 9900 feet and the other at the base of sagebrush at 8400 feet. These data indicate that the bird ranges through at least two zones, and Alexander and Betts state that it breeds from the foothills to timber line. It is, therefore, clearly not confined to one zone and appears to nest wherever local conditions fit its requirements.

Gray-headed Junco.—Seven nests of the Gray-headed Junco were discovered, all on the ground and well-concealed, but in a great variety of cover. The following list gives the cover of each nest and its elevation.

Amid shrubby cinquefoil.....	10,100 feet
Amid creeping juniper	9,900
Under a log	9,700
Amid creeping juniper	9,500
Under dead lodgepole branches	9,400
Under dead lodgepole branches	9,200
Under an overhanging rock	9,000

All these nests are in the Canadian zone, but a summer's observations have convinced the author that this species breeds all the way from 8000 feet to timber line. Alexander (1937) verifies this. Young birds just out of the nest were observed in late July at Lake Isabel, an elevation of 11,000 feet. The great inconsistency in type of nest cover

seems to fit in well with a wide breeding range, for the bird is not limited to any particular vegetation and thus to no certain zone.

White-crowned Sparrow.—Two nests of this species were found, one about twelve inches off the ground in a sub-alpine fir at 11,300 feet, and the other just above the ground in a willow at Goose Lake, 10,500 feet. Sclater and Betts list this bird as breeding from 8000 feet up through timber line. Alexander states that it is especially abundant in the wind-timber just below timber line. This latter fact has been observed by the writer, but White-crowned Sparrows have been seen commonly between 9800 feet and timber line, making it seem probable that they are not restricted to any one zone, but breed in spots determined by local conditions. It is likely that many of the best nesting sites occur in the Hudsonian zone, making the bird a common species there.

DISCUSSION AND SUMMARY

The distribution of birds as related to life-zones is a topic which will require a tremendous amount of study and a large accumulation of data before any satisfactory answers can be given. I have attempted to make a contribution of nesting data and possible conclusions toward that end. It seems obvious that life-zone and local habitat are indirectly related. Local habitat refers chiefly to vegetation, or a lack of it; and vegetation of a certain type usually grows in certain zones. There are many exceptions to this rule.

The American Pipit appears to be confined to one zone, the Arctic-Alpine, and may be accurately said to be "characteristic" of that zone. Undoubtedly local habitat varies within the zone and is important in the selection of a nest site, but the bird's distribution certainly comes closer to correlating with one life zone than that of any other observed in this study.

The Dipper definitely is a bird of opposite tendencies, breeding entirely according to local conditions, regardless of zone and altitude.

The American Magpie, Red-naped Sapsucker, and Warbling Vireo appear restricted to certain vegetation for nest sites and breed wherever their preferred vegetation grows, regardless of zone. However, that vegetation usually occurs only in certain zones, so that these species are somewhat limited to zones by their own habitat requirements, a correlation of the two apparently opposite factors.

A large number of species appear to breed practically from the plains to timber line, disregarding zone and altitude, and nest wherever local conditions are satisfactory. In this group are the Robin, Mountain Bluebird, Broad-tailed Hummingbird, House Wren, and Red-shafted Flicker.

A number of other birds appear to breed from 8000 feet to timber line, regardless of zone. In this class may be listed the Gray-headed Junco, Green-tailed Towhee, Townsend Solitaire, and Hermit Thrush.

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Thornton Township High School, Harvey, Illinois, December 3, 1942.

THE PTERYLOSIS OF THE KING VULTURE

By HARVEY I. FISHER

The King Vulture (*Sarcoramphus papa*) of Central and South America is the only cathartid genus whose pterylosis has not been investigated. The purpose of this study is to point out major points of similarity and difference between the feather tracts of the King Vulture and the general pattern previously described for New World vultures. In addition, the more significant differentiating characteristics of the pterylography of each genus is summarized in tabular form.

The skin (no. 85525 Mus. Vert. Zool.) and the alcoholic specimen (no. 85524 Mus. Vert. Zool.) which were studied were obtained in El Salvador in February, 1942, by a party from the University of California. Both specimens are adult males.

The placement and the configuration of the feathers of the head are two of the most variable features of the pterylosis of the cathartid vultures. For that reason photographs (figs. 21-24) of the heads of *Cathartes*, *Coragyps*, *Vultur* and *Sarcoramphus* are here presented; they have not previously been illustrated.

Fig. 21. Black Vulture (*Coragyps atratus*)Fig. 22. Turkey Vulture (*Cathartes aura*)

Capital tract.—Although the entire head of *Sarcoramphus* is not covered by feathers, in the regions where feathers (bristles) do occur they are more closely spaced than in any other cathartid; only in the coronal and submalar areas are they sparsely placed. Consequently the covering of the head presents several sharply delimited regions. All the bristles of the head are black.

The lower ocular apterium is ovoid, 1.5 cm. long and lies entirely below the eye; it is not confluent with any other apteria as it is in all other members of the family. The upper ocular apterium is an isolated, narrow band above the eye. There are no eyelashes. An apterium 17 mm. wide and 33 mm. long extends ventrally from the lower part of the loreal region, across the anterior end of the auricular tract, past the angle of the mouth, through the middle of the length of the malar area and into the submalar and interramal tracts. Its anterodorsal edge is continuous with the nude cere. The cere together with the caruncle limits the forward extension of feathers in the frontal and loreal regions.

There is no connection between the ruff on the neck and the feathers of the head. The extreme upper part of the dorsal-cervical tract is nude except for a middorsal band (3 cm. wide) of bristles 1 to 5 mm. long, spaced at intervals of 1 to 2 mm. No bristles or feathers are present in the post-auricular and interramal regions. Except for a dense fringe of bristles in its dorsal one-half and a few scattered bristles in the midline, the submalar region is bare.

In the frontal area the bristles are uniformly spaced at intervals of approximately 1 mm. and in groups of 1 to 6; in length they range from 2 to 7 mm. The most anteriorly situated bristles lie between the posterior ends of the nostrils where they form a V-shaped area bounded on the sides by the cere and on the apex by the caruncle. In the upper half of the loreal tract the bristles range up to 7 mm. in length and are spaced at intervals of less than 1 mm.; the ventral half of the loreal region has no bristles. The superciliary tract possesses bristles spaced as in the loreal area, but they become

shorter dorsally and posteriorly as the superciliary tract merges with the frontal and coronal areas. The dorsal half of the ocular region is without bristles, but the ventral part has closely-set bristles, the longest of which are 7 mm.

The bristles of the middorsal part of the coronal tract are the most widely spaced of any on the head; in places the interval is 3 mm. and on one specimen a circular spot 1.5 cm. in diameter was nude. Laterally the bristles become shorter, and at the junction with the auricular area they are placed only 0.5 mm. apart. In the anterior and posterior thirds of the occipital tract the spacing is the same as in the lateral parts of the coronal tract. However, a band (8 to 12 mm. wide) of closely-set (never more than 0.5 mm.) bristles which originates immediately posterior to the lower ocular apterium passes posterodorsally across the dorsal part of the auricular area and through the middle third of the occipital tract to the dorsal midline (fig. 23). There it meets its counterpart from the opposite side. Almost immediately the bands separate and extend posteriorly on either side of the midline. As they proceed caudally they become narrower, and the bristles become more widely spaced. The bands end 4 cm. anterior to the ruff. Between the bands on the posterior part of the occipital tract are short, sparse bristles.

Another distinctive band (10 to 12 mm. wide) of dense covering starts below the lower ocular apterium, crosses the auricular area and the posterior end of the malar region, and touches the dorsal part of the submalar tract in which it passes anteriorly; in the anterior part of the malar tract it extends dorsally to the angle of the bill.



Fig. 23. King Vulture (*Sarcoramphus papa*).

The major part of the auricular area, the anteroventral part of the occipital area and the postero-dorsal part of the submalar area are covered by granular folds of skin. On the folds the bristles are short and sparse, but between the folds they range up to 6 mm. in length and are set at intervals of less than 1 mm. (fig. 23). The auricular apterium is incomplete anteriorly, but posteriorly the apterium is widely continuous with the completely nude postauricular area.

The absence of an auricular ring of feathers is significant; the ring is present in all other cathartids and is even a characteristic of all other falconiforms which have been examined.

Spinal tract.—The dense, plumaceous feathering of the ruff begins 4 cm. posterior to the most caudal bristles of the head. The ruff is limited to the dorsal-cervical region and the dorsal edge of the ventral-cervical area on either side. In length the feathers vary from 3.5 to 5 cm.; a few are semilanceolate, but the shape of the majority resembles that of the contour feathers of the body. The basal one-third in all cases is white down; the middle fourth or third is made up of white barbs which are downy at their tips. The white barbs of the middle segment are loosely interconnected, but the silver-gray barbs of the distal third of the ruff feather are free. Feathers in the anterior one-half of the ruff project laterally and somewhat anteriorly; in the posterior one-half they extend posteriorly and laterally to merge with the body feathers.

Immediately posterior to the ruff the feathers have tawny-colored tips; a few of the ruff feathers may also be marked in this way. In the interscapular and dorsal regions the feathers are white and typical of contour feathers.

In *Sarcoramphus* as in *Vultur* and *Coragyps* the pelvic region is narrower and more axial than

in *Cathartes* and *Gymnogyps*. The contour feathers of this area are black; the down is white. A few are set on the midline. The oil gland is nude, and there is no postpelvic region.

Ventral tract.—There are no feathers or bristles in the anterior part of the ventral-cervical area, and the ruff is widely incomplete ventrally. Therefore, except for the few scattered bristles in the submalar tract the midline from the bill to the caudal end of the pelvis is an apterium. Only in *Sarcoramphus* of the New World vultures is this true.

All feathers in the ventral tract are white.

The sternal apterium is large and is similar to that in *Gymnogyps*. The abdominal tract has two rows of feathers extending to the anus.

Caudal tract.—Only in *Gymnogyps* and *Cathartes* is there any indication of a second row of minor under tail coverts. All under tail coverts are white; all upper tail coverts are black. The black rectrices which are 19 cm. long have no patagia around their bases.



Fig. 24. Andean Condor (*Vultur gryphus*)

There is no down about the cloaca. The anal circlet is incomplete ventrally, but two rows of small white feathers on the dorsal side extend laterally to connect with the few feathers in the post-ventral tract which shows the same pattern as in the California Condor.

Humeral tract.—The placement of feathers is similar in all cathartid vultures. In *Sarcoramphus* all the feathers are white except those in the two posterior rows; in the most caudal row the feathers are black except for a small amount of white near the base. There are one or two black-tipped feathers in the next to the last row.

Alar tract.—The 10 white tertiaries are approximately 10 cm. long. There are 22 greater secondary coverts which are 10 to 12 cm. in length; these coverts are black except in their basal thirds which are white. The longest secondary is number 21; it is 16 cm. long. The twenty-one secondaries are black except in their basal parts; the lateral vane is white in its basal 3 cm., and the medial vane is white in its basal one-fourth to one-half.

As in other cathartids 11 primaries are present; number 11 is vestigial, 3.5 cm. long and entirely white. The longest primary (34 cm.) is number 8. The 10 medial primaries are black with white areas proximally as in the secondaries.

Ten black greater coverts and 7 white middle upper coverts beginning distal to greater covert number 4 are present on the hand. The carpal covert is white. The 4 large alular feathers, the longest of which is 13 cm., are black with a small amount of white at the base. On the pollex is a sword-like claw which measures 1.5 cm. on one wing and 2 cm. on the other.

All under wing coverts are white.

Femoral and crural tracts.—The feathers in these tracts are white and are placed as in the other cathartids.

As Compton (Univ. Calif. Publ. Zool., 42, 1938:173-211) has shown in his study of the pterylosis of the falconiforms, points of difference and similarity in the feather tracts may be used as aids in determining familial relationships. He found that it was possible to set up a general pattern for each family. Because he used *Cathartes* alone

as an example of the Cathartidae, subsequent studies (Miller and Fisher, Condor, 40, 1938:248-256; Fisher, Auk, 56, 1939:407-410, and Condor, 44, 1942:30-32) of the New World vultures have made necessary the revision of his cathartid pattern. It is now possible to establish a basic pattern common to all the members of the family.

Table summarizing similarities and differences in the pterylosis of New World vultures

	<i>Cathartes aura</i>	<i>Coragyps atralis</i>	<i>Sarcoramphus papa</i>	<i>Gymnogyps californianus</i>	<i>Vultur gryphus</i>
ocular tract	2 rows of eyelashes on lower lid; 1 row on posterior $\frac{2}{3}$ of upper lid	2 rows on lower lid; 1 row on posterior $\frac{1}{2}$ of upper lid	no eyelashes	no eyelashes	no eyelashes
ocular apteria	narrow; meet posteriorly	continuous with loral apterium; meet anteriorly and posteriorly as in <i>Cathartes</i>	wide; do not meet	confluent with bare areas of crown and face	continuous with loral apterium; meet widely posteriorly as in <i>Cathartes</i>
interramal tract	feathered posteriorly		nude	nude	
submalar tract	heavily bristled	few scattered bristles	as in <i>Coragyps</i>	as in <i>Cathartes</i>	long, semi-plumaceous feathers
auricular tract	long and closely-set bristles; 2 to 3 rows about meatus	as in <i>Cathartes</i>	no feathers about meatus	largely nude; isolated ring about meatus	no definite rows about meatus
post-auricular tract	feathered	short, closely-set bristles	nude	semi-plumaceous feathers	sparsely bristled
ruff	least evident; semi-lanceolate feathers	as in <i>Coragyps</i> but more evident	pronounced; lanceolate feathers and down	pronounced; lanceolate feathers	most pronounced; downy
pelvic region	broad	narrow	narrow	broad	narrow
oil gland	nude	down often present	nude	nude	nude
ventral cervical apterium	narrow	wide	wide	narrow	wide
sternal apterium	vestigial; 1 to 3 rows of feathers lateral to it	evident; 3 rows lateral to it	pronounced; 1 row lateral to it	as in <i>Sarcoramphus</i>	as in <i>Sarcoramphus</i>
abdominal region	1 row in front of anus	1 to 3 rows	2 rows	1 row	3 rows
number of minor under tail coverts	12	6	6	6	6 to 8
number of lesser under tail coverts	2	none	none	2	none
anal circlet	2 rows; incomplete	1 to 2 rows; incomplete	2 rows; incomplete	1 row complete; 1 row incomplete	2 rows complete; 3 rows incomplete
number of tertiaries	9	9	10	10	13
number of secondaries	18	19	21	22	25
number of middle upper coverts on hand	8	8	7	7	8

Features of the pterylosis which differentiate the cathartids from other falconiforms are: absence of a submalar apterium, vestigial or obsolete lateral cervical apterium, wide dorsal-cervical region, presence of a ruff, continuous dorsal and pelvic regions, fused sternal, axillar and subaxillar regions, a row of large feathers in the posterior subaxillar area, a definite sternal apterium, a femoral tract consisting of 5 to 7 longitudinal rows of lanceolate feathers on the posterior margin of the thigh, 4 alular quills, absence of a patagium about the bases of the rectrices, an essentially nude oil gland and a reduced number of lower tail coverts.

Other, less important, characteristics common to the New World vultures are: feathers or bristles of the loreal region and most closely set of any on the head, reduced covering in the coronal and occipital areas, presence of 12 rectrices, 12 upper tail coverts, 12 major under tail coverts, and 11 primaries (eleventh vestigial), absence of a carpal remex, and presence of a carpal covert and 10 greater upper coverts on the hand.

It is not desirable to use criteria dealing solely with a part of an organ system, as for example, feathers, to set up phylogenies or relationships. However, it is feasible to use these characters in conjunction with a number of others; thus relationships as indicated by the feather tracts may be of significance.

Reference to the table will show that the pterylosis of each genus has certain features peculiar to it. For example, the number of secondaries is different for each; *Cathartes* has 12 minor under tail coverts, and the sternal apterium is vestigial; *Coragyps* often has down on the oil gland; in *Sarcoramphus* the ocular apteria are not confluent, the postauricular tract is nude, and there are no feathers about the auditory meatus; in *Gymnogyps* the head covering is the most reduced; the ruff is downy, and long, semi-plumaceous feathers are found in the submalar tract of *Vultur*.

More important for the study of relationships are the characteristics common to two or more genera. *Sarcoramphus*, *Gymnogyps* and *Vultur* lack eyelashes, and the ruff is pronounced, as is the sternal apterium. In these three genera a single row of feathers is present lateral to the sternal apterium. The number of secondaries and tertiaries is greater than in *Cathartes* and *Coragyps*; fewer remiges are perhaps to be correlated with lesser weight in the Black and Turkey vultures, but it is significant that *Sarcoramphus*, a bird of approximately one-third the weight of *Gymnogyps*, has only one less secondary than the California Condor.

Although *Cathartes* and *Coragyps* possess certain common characteristics such as eyelashes, feathers in the posterior part of the interramal region, 2 to 3 rows of feathers around the auditory meatus and 9 tertiaries, they differ in several respects. The postauricular tract in the Black Vulture has short, closely-set bristles as compared to feathers in the same region in the Turkey Vulture. The pelvic region is narrow in *Coragyps* and broad in *Cathartes*; the ventral cervical apterium is wide in *Coragyps* and narrow in *Cathartes*. The Turkey Vulture has 12 minor under tail coverts and 2 lesser under tail coverts; the Black Vulture shows only 6 minor under tail coverts and no lesser coverts.

In many of the ways in which the vultures differ, *Coragyps* shows similarity to *Sarcoramphus*, and especially to *Vultur*. On the other hand, *Cathartes* possesses the following characteristics in common with *Gymnogyps*: heavily bristled submalar tract, feathered postauricular region, broad pelvic area, narrow ventral cervical apterium, one row of feathers in the abdominal region anterior to the anus, and 2 lesser under tail coverts.

Museum of Vertebrate Zoology, Berkeley, October 25, 1942.

FROM FIELD AND STUDY

Competition between Mountain Bluebirds and Hairy Woodpeckers.—The following observation of a pair of Hairy Woodpeckers (*Dryobates villosus*) and a pair of Mountain Bluebirds (*Sialia currucoides*), in apparent competition for a nesting site occupied by the former, was made at Westwick Lake in the Cariboo region of British Columbia on June 3 and 5, 1937.

A female Mountain Bluebird was seen to enter and leave a hole in the trunk of a live aspen (*Populus tremuloides*), one of a group of these trees on open prairie near the lake shore. As I approached the tree, the unmistakable cries of young Hairy Woodpeckers were heard, and the origin of the sounds was definitely located as coming from the cavity into which the bluebird had disappeared. For the ensuing fifteen minutes or so the tree was watched closely from a distance of ten feet and this, briefly, is what happened: Every few minutes the male woodpecker entered the nest to feed the young on ants which he obtained from a near-by aspen. The female woodpecker did not appear. Meanwhile both the female bluebird and its mate remained in the vicinity and showed constant interest in the nest. Sometimes the female hovered in front of the entrance and she entered the nest four times with nesting material in her bill. The male bluebird continued in close attendance, flying from branches to branch above the nest entrance where several times it was joined by the female. During this time there was no show of hostility on the part of any of the three birds concerned.

Two days later the nest was under observation for half an hour. The young woodpeckers were still vocal and their cries increased whenever I walked to the foot of the tree. In the course of this half hour the female bluebird once hovered in front of the nest entrance and once, carrying a long straw in her bill, attempted unsuccessfully to enter. For the remainder of the time the pair of bluebirds moved about restlessly in the branches of the aspen. The parent woodpeckers did not appear until near the end of the period of watching.

Circumstances did not permit further observation and the conclusion of the contest must remain in doubt. A somewhat similar incident has been reported by A. H. Miller (Auk, 52, 1935:467-468). In this case there was competition between the same species for a newly excavated nest and the woodpeckers were dispossessed.—J. A. MUNRO, *Okanagan Landing, British Columbia, October 27, 1942.*

Another Southern California Record for the Tennessee Warbler.—The Los Angeles Museum has recently received from Mr. L. E. Hoffman a mummified specimen of the Tennessee Warbler (*Vermivora peregrina*), which was found dead under a sycamore tree at the entrance to Kagel Canyon, Los Angeles County, California, on September 19, 1942. It appears worthy of note that the three other records for this species in southwestern California are also of birds found during the month of September.—G. WILLET, *Los Angeles Museum, Los Angeles, California, January 4, 1943.*

Sparrow Hawk Preys on Sanderling.—On December 27, 1938, as I drove into Sunset Beach near Watsonville, California, I disturbed a Sparrow Hawk (*Falco sparverius*) which flew out of a eucalyptus tree with a heavy, white burden. I kept chasing the hawk until it tired and dropped its prey. As I picked up the still warm body I was surprised to find that it was a Sanderling (*Crocethia alba*). This seemed to be an unusually large and active bird for this small falcon to prey upon. On December 28 I returned to the beach and saw a Sparrow Hawk, possibly the same one, perched on a post overlooking the beach, and noticed what was probably the same hawk flying over or looking over the beach a number of times after that. No other captures were observed, however, and I cannot say that this act was repeated. Average weights indicate that the Sanderling is equal to one-half the weight of the Sparrow Hawk.—ALBERT C. HAWBECKER, *Madera, California, January 2, 1943.*

A Record of the Montana Horned Owl in the State of Washington.—Three forms of Horned Owl, *Bubo virginianus saturatus*, *B. v. lagophonus*, and *B. v. subarcticus*, are currently listed as occurring in the state of Washington. A record of a fourth subspecies in the western part of the state should therefore be of interest. In a set of several skins from the writer's collection recently submitted for identification to the Museum of Vertebrate Zoology at Berkeley, California, is one determined by Dr. Alden H. Miller as *B. v. occidentalis*. This specimen, no. 1136 JWS, was killed on or about November 14, 1940, at the state game farm near Auburn, King County, Washington, where on November 16 it was salvaged from a refuse pit by the writer. The bird proved to be a female with the following measurements: wing, 367 mm., tail, 225, culmen from cere, 28. Originally identified as of the race *pacificus*, which, like *occidentalis*, is apparently not recorded for Washington,

it was referred to the latter race by Dr. Miller with the following comment (letter of August 20, 1942): "I can match the color of your bird among specimens from areas typical for each of these forms. Since your bird is fairly large, and since this is a characteristic of *occidentalis* on the average, I should call it this rather than *pacificus*. It seems to me quite possible that birds from the normal range of *occidentalis* . . . might drift over to the coast in winter. This is much more likely than that they would move north from California."—J. W. SLIPP, Tacoma, Washington, October 8, 1942.

A White Meadowlark in Eastern Montana.—I was much surprised when a conspicuously white bird rose from a dense stand of western wheatgrass to perch on a sage bush and whistle the clear melodious notes of the Western Meadowlark, *Sturnella neglecta*. It was at noon on July 1, 1942, that I first saw this unusual individual at a point about 10 miles southwest of Miles City, Montana, on the experimental sheep range at the United States Range Livestock Experiment Station. Equipped with an 8-power binocular I pursued and observed this bird for an hour. My closest approach was about thirty feet. Not a trace of yellow or gray was seen in the plumage; it appeared entirely white. In manner this bird was shy and wary, noticeably more so than the normally colored meadowlarks with which it was associated. No evidence of impaired or faulty sight was observed even in the dazzling light of a mid-summer day on the plains. Numerous flights to the topmost twig of a distant sage were made with accuracy and perfect balance. Its song was unmistakably that of a Western Meadowlark.

On July 8 two field assistants and I saw this white meadowlark for the second time in the same vicinity. Each of us observed the bird through binoculars and concurred in my first observation of color, song and manner. Preparations were made to collect the specimen on the next trip to the locality but it was not seen again.—E. J. WOOLFOLK, Northern Rocky Mountain Forest and Experiment Station, Missoula, Montana, December 23, 1942.

Hooded Merganser in San Diego County, California.—The random bag of a duck hunter has placed in the scientific collection of the San Diego Society of Natural History a desirable specimen in the form of a female Hooded Merganser (*Lophodytes cucullatus*). The bird was shot on December 5, 1942, at Sweetwater Reservoir, an artificial body of water situated some 7 miles southeast of the city of San Diego. It was taken by Alvin G. Crawford, auditor for the California Water and Telephone Company, which controls the reservoir. Mr. Crawford turned over to the museum, for nature-study purposes, the ducks which he took on that morning, without realizing that there was a rarity among them.—CHARLES F. HARBISON, San Diego Society of Natural History, San Diego, California, December 31, 1942.

Bird Notes from Southwestern Utah.—So little is known regarding the status of many bird species in southwestern Utah that the following observations are thought to be worthy of record. These records have been accumulated over a period of one year, and are not restricted to one area alone. Of the localities listed below, Zion National Park, Springdale, Rockville and Hurricane are in Washington County; Hatch is in Garfield County; Duck Creek and Strawberry Creek are in Kane County; and Cedar Breaks National Monument is in Iron County. For simplification all records are given in chronological order and are for the year 1942.

On January 16 I was on ski patrol en route to Cedar Breaks National Monument and the trail took me past Duck Creek in the Dixie National Forest on the Markagunt Plateau. Here at an elevation of 8550 feet a large pond, spring fed, remains as open water throughout the winter months. It is surrounded by a heavy forest of aspen, white fir and Engelmann spruce. On that day the following birds were noted on this pond: 24 Canada Geese (*Branta canadensis*), 9 Pintail Ducks (*Dafila acuta*), 33 Green-winged Teals (*Nettion carolinense*), 8 Blue-winged Teals (*Querquedula discors*), 5 Cinnamon Teals (*Querquedula cyanoptera*), and 6 Mallards (*Anas platyrhynchos*). Insofar as I can determine, these constitute new altitudinal and winter records for these species in southwestern Utah.

The following day a number of winter bird records were obtained at Cedar Breaks National Monument at an elevation of between 10,300 feet and 11,000 feet. Here the forest of Engelmann spruce and alpine fir is broken by broad meadows as one approaches timber line. The following species were noted:

Penthestes gambeli. Mountain Chickadee. This bird was especially numerous throughout the forested zone and groups of five to ten were frequently observed.

Loxia curvirostra. Red Crossbill. Two large flocks were observed. One of these groups numbered at least thirty individuals. Others were heard in the region.

Myadestes townsendi. Townsend Solitaire. It was somewhat astonishing to find this bird in rela-

tively large numbers throughout the Monument and surrounding region. Equally interesting was the fact that many of these birds were singing as enthusiastically as though spring were at hand instead of many weeks of severe winter.

Spinus pinus. Pine Siskin. These tiny birds were everywhere to be seen and were the commonest species recorded.

Carpodacus cassinii. Cassin Purple Finch. A total of eleven of these birds was noted. For the most part they were rather quiet, only occasionally breaking the silence with call notes.

Nucifraga columbiana. Clark Nutcracker. Commonly observed throughout the forested area.

Dryobates villosus. Hairy Woodpecker. Only two of these were noted and they were ranging together. They were located in a rather dense forested growth in an area well protected from the strong winds.

Dryobates pubescens. Downy Woodpecker. A total of four of these birds were observed and all were noted in a protected grove of alpine fir.

Dendragapus obscurus. Dusky Grouse. Seven of these birds were flushed from the depths of a dense grove of Engelmann spruce. They refused to fly far, taking shelter as soon as possible.

Sialia currucoides. Mountain Bluebird. There were large numbers of these birds on the snow in the open meadows. They were observed working back and forth on the snow picking up something as they went. Investigation showed that the snow was literally alive with tiny insects. These proved to be some variety of horntail (*Sirex* sp.).

On February 1, two Winter Wrens (*Nannus hiemalis*) were observed in Birch Creek Canyon in Zion National Park. This constituted the first recorded occurrence of this species in the park since January, 1936, and the fourth record for the area.

Several migratory species were observed on the Sevier River near Hatch on February 14. Large numbers of American Mergansers (*Mergus merganser*) were seen scattered for several miles along the stream, while 7 Barrow Golden-eye (*Glaucionetta islandica*), 5 Lesser Scaup Ducks (*Nyroca affinis*), 1 Pied-billed Grebe (*Podilymbus podiceps*), and 1 Blue-winged Teal (*Querquedula discors*) were also noted in the same locality.

A California Gull (*Larus californicus*) was noted on a sandbar along the Virgin River near Springdale on April 23. This may have been a straggler from the Lake Mead region to the southwest. This is apparently the first record of this bird from Washington County.

On April 29, what is believed to be a Yellow-shafted Flicker (*Colaptes auratus*) was studied at close range in the town of Rockville near Zion National Park. This bird was definitely not a member of the *cafer* group as the shafts of its feathers were distinctly yellow instead of reddish, and the red band on the back of the head was prominent. This is believed to be the first record of this bird for southern Utah.

On July 17, a Great Blue Heron (*Ardea herodias*) was observed on Strawberry Creek on the Markagunt Plateau. This is at an elevation of approximately 8000 feet. Previous records from southwestern Utah are for winter or early spring months, and there are none from such an elevation.

Near Hurricane, an Eastern Kingbird (*Tyrannus tyrannus*) was recorded on August 29. This is believed to be the first record of this bird for southern Utah.

On September 27 a Goshawk (*Astur atricapillus*) was seen at Cedar Breaks National Monument at an elevation of approximately 10,500 feet. This constitutes the first record of this species from the area.

On September 30 a forest fire took me to the rim of Great West Canyon in Zion National Park. Several species of birds were flying around, obviously alarmed by the pall of smoke. Among these was a total of 18 Band-tailed Pigeons (*Columba fasciata*). While there have been a few records of this species from the Zion region in past years, never have such large numbers been noted before.—RUSSELL K. GRATER, Zion National Park, Springdale, Utah, January 18, 1943.

Birds Found Dead on the Beach in San Diego County, California.—The following is a list of birds found dead on certain beaches of San Diego County between October 20, 1941, and January 15, 1942 (a total of eighty-eight days). For the most part the records were kept for the sandy stretch of beach immediately south of the Scripps Institution of Oceanography at La Jolla. This was covered for a distance of half to three-quarters of a mile often enough that practically every bird washed up was counted. Also, several observations were made on the beach near the entrance to Mission Bay and on the Silver Strand near Coronado. Great care was taken not to count individuals more than once.

Common Loon (<i>Gavia immer</i>), January 22.....	1
Pacific Loon (<i>Gavia arctica pacifica</i>), October 24 (2), December 10, 28, January 10, 15....	6
Eared Grebe (<i>Colymbus nigricollis californicus</i>), November 10, December 28.....	2

Western Grebe (<i>Aechmophorus occidentalis</i>), October 24, December 25.....	2
Slender-billed Shearwater (<i>Puffinus tenuirostris</i>), October 28, 30, November 4, December 4, 10, 25 (5), 27 (3), January 10, 15 (2).....	16
Sooty Shearwater (<i>Puffinus griseus</i>), November 4 (9), 21 (3), 29.....	13
Pacific Fulmar (<i>Fulmarus glacialis rogersi</i>), October 13, 20, 24, 30 (2), November 3 (3), 4 (2), 18, December 25 (5), 27, 28 (2).....	19
Brandt Cormorant (<i>Phalacrocorax penicillatus</i>), October 24, 30, November 4 (2), 10, 27, December 10	7
Surf Scoter (<i>Melanitta perspicillata</i>), November 4.....	1
Western Willet (<i>Catoptrophorus semipalmatus inornatus</i>), December 25.....	1
Least Sandpiper (<i>Pisobia minutilla</i>), October 24.....	1
Northern Phalarope (<i>Lobipes lobatus</i>), October 30.....	1
Parasitic Jaeger (<i>Stercorarius parasiticus</i>), November 4.....	1
Western Gull (<i>Larus occidentalis</i>), December 25, 27, January 15.....	3
Royal Tern (<i>Thalasseus maximus maximus</i>), October 27.....	1
Ancient Murrelet (<i>Synthliboramphus antiquus</i>), January 15.....	1
Cassin Auklet (<i>Ptychoramphus aleuticus</i>), December 25 (5), 27 (3), 28 (3).....	11
Rhinoceros Auklet (<i>Cerorhinca monocerata</i>), January 13.....	1
Total	88

This list is not to be interpreted as indicating the relative abundance of off-shore birds. The Black-vented Shearwater, for example, was present during this whole period, often in quite large numbers (Kenyon, Condor, 44, 1942:232). However, not a single dead bird was washed ashore in the areas I covered. The list is more an indication of those species least able to withstand adverse weather conditions. Most of these birds apparently died as a result of heavy seas, either starving when unable to get fish or being unable to withstand the action of wind and waves, or a combination of both. However, several exceptions were as follows: one Sooty Shearwater's neck was nearly severed (probably by a fisherman), a Pacific Loon was saturated with oil, and the Willet and one of the Western Gulls were apparently shot. A number of the birds were in such bad condition that the exact cause of death could not be determined.—KARL W. KENYON, *La Jolla, California, August 31, 1942.*

Birds Eat Snow.—In the dry Southwest certain areas are useful for grazing only when some snow is on the ground, thus affording horses, cattle or sheep a chance to slack their thirst by eating snow. In winter deer may be seen eating snow.

That birds also depend upon snow when it is available was vividly called to my attention here in Grand Canyon National Park, Arizona. On November 28, 1942, I noted Red-backed Juncos (*Junco phaeonotus dorsalis*) coming to a ledge outside my office window. When I stopped to observe closely at a distance of six feet, I found them eating snow, a small patch of which remained on the shaded stone ledge. Shortly thereafter, a Mountain Chickadee (*Parus gambeli*) came for several mouthfuls of snow. No water was available for a considerable distance and the weather was fairly warm and sunshiny.

Again on the morning of November 30 a half dozen Oregon Juncos (*Junco oregonus*) ate snow at the same place, working hard to break loose the snow crystals now hardened into ice. They were soon joined by a couple of Red-backed Juncos and a Mountain Chickadee. On December 6 when a new snow had fallen, a flock of English Sparrows (*Passer domesticus*) were seen greedily eating snow at the mule barns.—HAROLD C. BRYANT, *Grand Canyon, Arizona, December 11, 1942.*

Relations between Birds, Highways, and Snows in Nevada.—On January 3, 1942, while traveling from Hawthorne through Fallon to Reno, Nevada, concentrations of birds, especially Horned Larks (*Otocoris alpestris*), were noted on the highway pavements and edges. Recent snows covered all the ground, and apparently the scraped highways afforded the only exposed surface for birds. Groups of Horned Larks, Western Meadowlarks (*Sturnella neglecta*), White-crowned Sparrows (*Zonotrichia leucophrys*) and English Sparrows (*Passer domesticus*) were seen feeding, chiefly at the edges of the highways. Flocks of Horned Larks, however, were frequently just standing on the pavement and thus approaching their usual ground-resting habits. The result was a high mortality, caused by automobiles. On U. S. Highway 50 just west of Fallon, for example, 30 dead larks were seen in 3 miles. This probably represented birds killed during 2 or 3 days and in a region where the larks were particularly common. In any case, the total mortality among Horned Larks must have been considerable, especially since the snow did not melt appreciably for over a week.—FRANK RICHARDSON, *University of Nevada, Reno, Nevada, January 15, 1942.*

Evening Grosbeak at Big Bear Lake, San Bernardino County, California.—I have been going to Big Bear Lake in the San Bernardino Mountains for a number of years, and since I have never observed an Evening Grosbeak (*Hesperiphona vespertina*) there previous to October 16, 1942, a record for that date may be noteworthy. About noon Mrs. Kent, Ruby Curry and I came suddenly upon 12 Evening Grosbeaks apparently sunning themselves in a tree some 20 feet from the ground. There was a single mature male in the group. After we had watched them for some time they flushed and flew to the top of another pine. In the half hour they were under observation there was no indication of any feeding.—W. A. KENT, Los Angeles, California, December 15, 1942.

Winter Visitant Rosy Finches in Northeastern California.—Records of wintering rosy finches in California are scarce, perhaps because little effort has been made to search for them in the plateau areas along the eastern border. An unusual opportunity to observe these birds was afforded one of us (Twining) on March 30, 1941, when approximately 300 individuals were found occupying mine shafts situated 2 miles south and 3 miles north of Chats, southern Lassen County, at an altitude of 5500 feet. Here a line of three vertical shafts extends up the west slope of the mountain range that borders Long Valley on the east. The rosy finches were using roosting sites on the irregular rocky sides of the shafts.

In the lower shaft there were approximately 150 birds, in the next about 25, and in the third 125. If the birds were not disturbed, there was no evidence from the exterior that the shafts were inhabited. A rock tossed down the hole would cause the rosy finches to flutter back and forth, and some of those nearest the top would fly out. At the lower shaft, the birds were thus harassed at intervals from 1 p.m. until 5:15 p.m. Some evidently did not emerge at any time in this period in spite of the frequent disturbance. The few that did fly out circled the hole in flocks and usually flew back in as soon as the intruder withdrew a few yards from the edge of the hole. Occasionally a few birds lit on the ground near by, but there was little evidence of feeding at such times. There seemed to be a compelling urge to return to the perches in the shaft. The weather was warm and there was no snow on the ground. Thus there was no need for the protection of the shafts during the day.

The flock proved to be of mixed character, at least three forms being represented in it. Thirteen birds collected at random were saved as specimens (Mus. Vert. Zool.). These have been identified as follows: Gray-crowned Rosy Finch (*Leucosticte t. tephrocotis*), 7; Hepburn Rosy Finch (*Leucosticte t. littoralis*), 4; Black Rosy Finch (*Leucosticte atratus*), 2. None was assignable to *Leucosticte t. dawsoni* which breeds in the Sierra Nevada of the Tahoe district 50 miles to the southward. The examples of *Leucosticte t. tephrocotis* are the first recorded from California, although this form has been reported from Reno, Nevada (Linsdale, Pac. Coast Avif. No. 23, 1936:119). Search was made especially for the race endemic in the Wallowa Mountains of Oregon, but to no avail. This form, *L. t. wallowa*, has been recorded but once outside of its breeding range, at Ramsey, Lyon County, Nevada, on November 15, 1941 (Alcorn, Condor, 45, 1943:40).

The examples of *L. t. littoralis* from Lassen County are the first winter-taken specimens reported from the State. Recently *littoralis* has been found breeding on Mount Shasta, Siskiyou County (A. H. Miller, Condor, 41, 1939:219). The two Black *Leucostictes* constitute the second and third records from California; the first was from Bodie, Mono County (Swarth, Condor, 30, 1928:191).—ALDEN H. MILLER, Museum of Vertebrate Zoology, Berkeley, and HOWARD TWINING, California Division of Fish and Game, San Francisco, California, November 22, 1942.

NOTES AND NEWS



Fig. 25. James L. Peters, president of the American Ornithologists' Union and author of the "Check-list of Birds of the World."

In the diversified terrain of the West, birds of the same species frequently breed at different times at stations in the same latitude. A recurrent explanation of such phenomena is that some individuals nest first at lower elevations or in warmer localities and later in the same spring season move up-mountain to nest again in places that are then more favorable. Plausible as this explanation may be, we have for some time watched in vain for evidence that this actually takes place. Indeed we should like to solicit the aid of bird-banders and others in proving that an individual nests in two widely separated places in the same year. Skepticism that such movements occur increases with our knowledge of the different states of advancement of the reproductive cycle that can exist in members of the same species, as for example in White-crowned

Sparrows (Blanchard, Univ. Calif. Publ. Zool., 46, 1941:1-178) and in Oregon Juncos (Wolfson, Condor, 44, 1942:237-263). In these species, birds destined to migrate later will remain through early spring on common ground with another population that is engaged in nesting without themselves participating. Why can not this be true of altitudinal migrants? The late nesters of high altitude could remain far south or unobtrusively in the lowlands. Later at higher altitudes when they were conspicuously active with nesting, the early nesters of the lowland would have become quiescent and might even be molting, or they would have dispersed as postbreeding vagrants, often moving up slope, but not to nest again. Here is a problem that needs critical study by western ornithologists.—A.H.M.

PUBLICATIONS REVIEWED

The Fossil Birds of California, an Avifauna and Bibliography with Annotations (Univ. Calif. Publ. Zool., 47, 1942:47-142), by Loye Miller and Ida DeMay, is a valuable addition to the library of all ornithologists regardless of previous interest or knowledge of fossil birds.

In concise form, excellently arranged for ready reference, it affords a glimpse of bird life of the past which serves to enrich the appreciation of bird study today. Without a doubt it will fulfill the purpose desired by its authors: "First of all, it is planned as a workman's tool offered to those who may take up the study of this field. . . . Secondly, we hope that it may stimulate interest on the part of students who have not yet come to realize that paleontology is a live subject."

A subject still in its infancy as the century entered its second decade, paleornithology has grown so gradually that it is astonishing to see the wealth of information now available, as set forth in this complete review of previous publications on the California horizons. This information is presented in three main sections, each complete in itself. In the first section the thirty fossil bird localities of California are arranged in order of age, from the Miocene to the Pleistocene. The location of the deposit, the nature of the matrix, type of environment represented, associated animals, a list of the birds found and a reference list of literature are here recorded. The arrangement of the second section is taxonomic. The nearly two hundred species of birds known from the geologic past of California are listed and briefly discussed, with references appended. Common names are offered for each extinct form, providing convenient means of reference and serving, also, to bring to life these birds of long

ago. The third section, a full bibliography of California fossil birds, completes the work.

To the specialist in the field of paleornithology this paper is of exceptional value, supplying in one volume all essential data relative to the published work on the subject for the state of California. As a matter of fact, information is not limited to this state, for in many instances, reference is made to similar occurrences elsewhere. Inclusion of all recorded avian fossil material even if only generically or tentatively assigned—with appropriate comments as to status—is welcomed. These records, which may lead to important future correlations, might otherwise be easily overlooked.

The paper is more than a check-list or bibliography. It carries throughout its pages interesting and illuminating sidelights on avian habits, structure and the like, reflecting Dr. Miller's long experience in ornithological research.—HILDEGARDE HOWARD.

Inaugurating a new series of publications, the National Audubon Society has issued its Research Report No. 1, "The Ivory-billed Woodpecker," by James T. Tanner (October, 1942; 111 pp., 22 figs., 20 pls., colored frontispiece). The admirable plan of the Society for careful study of vanishing species with a view to ascertaining underlying biologic causes for their precarious states could have selected no better subject for the initial effort. Tanner evidently made good use of his opportunity for field work supported by the Society and he has rendered an informative and worthy report; the only criticism that need be levied is that it is somewhat repetitious in places.

It turns out that the Ivory-billed Woodpecker has an extremely narrow ecologic niche, in that it is dependent for food on insects living just beneath the bark and these may be obtained in sufficient quantity by this large bird chiefly in trees that are still standing but that have been dead from two to four years. Maintenance of the necessary succession of suitable dead trees conflicts sharply with timber interests and with customary practices in forestry. With this economic conflict, the Society and others interested in saving the Ivory-bill face an exceedingly difficult problem in conservation. The prospect for the Ivory-bill is not good, especially in Louisiana.

Apart from the applied aspect of the study, sight should not be lost of another service it performs. A record of the natural history of this species has been made which may never again be possible. More could have been found out about the biology of a less rare species with the same expenditure of time and money, but there is a real satisfaction here in having grasped a research opportunity that may some day be be-

yond reach. This also is conservation.—ALDEN H. MILLER.

Joseph Grinnell's *Philosophy of Nature* (University of California Press, 1943) is a compilation of twenty-eight of the shorter papers of the great California naturalist, with a four-page preface by Alden H. Miller. In this preface we are told of Grinnell's plan, that upon retirement he would write a book of general scope which would present his outlook on geography and evolution, the aspects of natural history most related to his own research. He had, in fact, outlined chapter headings for such a work, these headings, ten in number, being listed by Miller. It was undoubtedly a great loss to science that this plan was ended by Grinnell's untimely death.

According to the Grinnell Club Newsletter of February, 1943, Jean M. Linsdale was primarily responsible for the idea underlying the present volume. After studying Grinnell's lengthy bibliography, Linsdale submitted a tentative list of papers that might be used in the projected compilation. This list was carefully studied by Mrs. Joseph Grinnell, Alden H. Miller, E. Raymond Hall and Seth B. Benson and suggestions were made which resulted in some titles being added. It was decided that the order of the papers should be chronological, and that, instead of including only those of definitely related subject matter, the selection should be illustrative of the wide scope of Grinnell's interest in and knowledge of many different features connected with the science of vertebrate zoology.

The elapsed time between publication of the first and last papers is thirty-three years, from 1903 to 1936. As would be expected by those familiar with Grinnell's work, a majority of titles (fifteen) and even greater preponderance of subject matter pertain to geography, evolution and kindred subjects.

Control of the range of a species by atmospheric humidity, and variation within the species due to the same influence is demonstrated in "The origin and distribution of the chestnut-backed chickadee" (1904). In "Composition of the Prince William Sound avifauna; discussion of its origin" (1910) typical birds of the Hudsonian and Alpine-Arctic life-zones are listed, and the affinities of the avifauna with the Yukon region to the north and the Sitkan district to the south are discussed. Two discussions published in 1914, "The Colorado River as a highway of dispersal and center of differentiation of species," and "The Colorado River as a hindrance to the dispersal of species," present many facts substantiating the claims set forth in the titles. An example cited in the latter paper is the case of two species of ground squirrels (*Ammospermophilus*), the ranges of which in one section are

divided by only 850 feet, the width of the river. Along similar lines is "Barriers to distribution as regards birds and mammals" (1914). Here barriers are divided into two classes, tangible and intangible. Under the former are land, to aquatic species, and bodies of water, to terrestrial species. Intangible barriers are listed as zonal (by temperature), faunal (by atmospheric humidity), and associational (by food supply, breeding places, and temporary refuges).

In "Field tests of theories concerning distributional control" (1917) it is contended that careful study at *all* points of the periphery of an animal's range is necessary to demonstrate the factors responsible for range limitation, for, while temperature may often exert the greatest influence, other factors always appear at some point. "The English sparrow has arrived in Death Valley: an experiment in nature" (1919) records the occupation, about 1914, by *Passer domesticus* of a portion of Death Valley 178 feet below sea-level, and points out the opportunity for future naturalists to determine the length of time necessary to produce any perceptible physiological changes in these birds, which are isolated under a climate of extreme high temperature combined with low relative humidity. "The role of the accidental" (1922) is considered by Grinnell to be that of the "pioneer," crowded out of the normal range of its species by overpopulation. In the great majority of cases such individuals are foredoomed to early destruction, but in rare instances two birds comprising a pair may come together under such favorable conditions that a new outpost of the species is established. As a side light on the occurrence of "accidentals" in California, it is estimated that, on the basis of the rate of recorded occurrences in the state for the previous 35 years, theoretically all the species of birds known to North America should be on the California list by the year 2331.

In "The trend of avian populations in California" (1922) it is contended that although a certain few species of birds have become extinct in the state during the past 75 years, these, so far as number of individual birds is concerned, have been compensated for by introduction of foreign species; furthermore, though drainage of swamp lands has reduced the totals of some kinds of birds, increase in other kinds through irrigation of previously barren regions has more than offset such loss numerically. The theme of "Geography and evolution" (1924) is that evolution of animal life is the direct result of evolution of environments. "Geography and evolution in the pocket gopher" (1926) is accompanied by a distributional map and a colored plate showing eight different types in the genus *Thomomys*. The 33 kinds of pocket gophers accredited to California at the time this paper was written are discussed

as regards their origin, variation, range, and habits, and reasons are advanced to account for many peculiar features of their distribution.

"Presence and absence of animals" (1928) is a very comprehensive and important contribution to knowledge of the factors governing distribution and control of animals. The continual attempt of a species, due usually to overpopulation, to expand the boundaries of its habitat or "ecologic niche," and the resulting destruction of pioneering individuals, usually the young of the year, is emphasized, as is the removing or rendering permeable of natural barriers through the various activities of man. Introduction of foreign birds and mammals, either fortuitously or otherwise, is regarded as usually dangerous to our native fauna. Nine separate areas in Lower California, two of them insular, each possessing species or subspecies of birds peculiar to itself, are defined and mapped in "Differentiation areas" (1928). Also, affinities of many Lower California birds and factors causing differentiation are discussed, together with such related subjects as barriers to emigration and potency of differentiating centers.

"Significance of faunal analysis for general biology" (1928) stresses the value to the student of evolution of the barely discernible subspecies, because of its being in the critical, formative stage, whereas the full species is no longer of similar significance. After discussion of various factors that have been advanced as causes of differentiation, the author concludes with the opinion that the problem of speciation lies much closer to the provinces of the geographer and climatologist than to that of the geneticist.

In the field of ecology, "The burrowing rodents of California as agents in soil formation" (1923) is, by far, the best exposition of its particular subject that has come to the attention of the reviewer. Illustrated by photographs showing soil disturbance by burrowing rodents, this article points out clearly and convincingly the surprising effects of work of these animals in untilled sections of California. Among these effects are listed the hastening of the weathering of the sub-stratum, the bringing to the surface of the sub-soil, the piling up of loose earth which, moved by wind and water, fills up depressions and creates meadows, the conservation of water by retarding the spring run-off, and rendering the soil more fertile by loosening as well as by burying accumulated vegetable debris. And, according to the geological record, this has been going on for at least 200,000 years! Study of this paper should be compulsory in every agricultural school.

"Tree surgery and the birds" (1927) voices the feeling of antagonism that comes to all lovers of wild-life in its natural state when human ideas

of orderliness conflict with natural processes. An oak tree just outside the author's office window has submitted to pruning of all dead limbs and plugging of cavities with cement, resulting in destruction of favorite nesting, feeding and roosting places of several species of birds. "Linnets and dandelions" (1930) recounts the invasion of a city lawn by the lowly dandelion, with resultant disgust to the owner of the lawn and pleasure to some of the neighbors, who delighted in the songs of linnets attracted by dandelion seeds. The opening question of this short paper, "Is it feasible to blend sentiment with natural history and at the same time maintain fairly high factual and rational standards?" is typical of Joseph Grinnell, as his friends knew him, sentimental at heart, but ever on the alert against any betrayal of the fact. "Up-hill planters" (1936) propounds a very logical theory in reforestation. As acorns falling from oak trees on steep hillsides almost invariably roll down hill, some agency is necessary to prevent gradual altitudinal shifting of the forest itself. This agency is believed to be found in jays, squirrels, and other animals, through their habit of carrying away acorns, often up-slope, to be deposited in crevices or buried in the ground for future use.

"Call notes of the bush-tit" (1903) describes several types of notes of these birds, that almost invariably travel in flocks. The simple notes usually heard are believed to be the means of keeping the group together, while what is called the "confusion chorus," a shrill, monotonous trill, chanted continuously by all members of a flock in unison, is used only during the presence of avian enemies, and is thought to confuse a predator as to the definite location of any individual. "Sequestration notes" (1920), used by birds that forage singly, such as the Audubon warbler and kinglets, are believed to act to keep individuals apart, in such a manner as to avoid duplication of territory already scrutinized. "The principle of rapid peering in birds" (1921) advances the theory that birds that feed on small, stationary objects find them more easily by frequently changing their angle of vision by movements of the head and body. "A possible function of the whiteness of the breast in crevice-searching birds" (1924) calls attention to the white breast of the canyon wren and other birds that search crevices for much of their food, and suggests that reflection of light from white plumage may aid the vision of the searcher.

Among the miscellaneous papers included in this book are two on museum functions and ethics. "The methods and uses of a research museum" (1910) sets forth rules for the field collector, particular stress being laid on the amount and character of data to be recorded; also many uses, both educational and economical, to which

preserved material may be put, are listed and discussed. "The museum conscience" (1922) emphasizes the need for absolute accuracy in labelling and arrangement of museum materials, such to be obtained only through curatorial work of a high standard.

"Bird netting as a method in ornithology" (1925) relates the arrest of four "Italians" and seizure of their nets illegally used in capture of song birds for the pot; 133 birds of thirteen species were turned over to the Museum of Vertebrate Zoology. A study of these having shown that, with one possible exception, no injuries had been inflicted on them during the process of netting, Grinnell applied to the Fish and Game Commission for permission to use the nets for collecting and banding birds. This permission was denied on the ground that it would set a bad example to "Italians," and surprise was expressed at the "audacity" of the request.

"A conservationist's creed as to wild-life administration" (1925) expresses belief that the fullest use should be made of our wild-life resources; that game birds and mammals belong no more to the sportsmen than to non-hunters; that collecting specimens of vertebrates for scientific purposes is right and necessary; that the best known way to conserve animal life is to preserve conditions favorable to our native species; that grazing by domestic stock, particularly sheep, on the greater part of our national forests should be discontinued, and that administration of our wild life resources should be kept as far as possible out of politics. Opposition is expressed to attempts to exterminate any native vertebrate species; to permitting the public to shoot crows or other presumably injurious animals during the breeding season of our desirable species, and to introduction of alien species of either game or non-game birds or mammals.

"Conserve the collector" (1915) is a sane and logical argument against the fallacious reasoning of some sentimentalists, game commissioners and others, that properly regulated scientific collecting has any affect whatever on the permanent numbers of any species of bird or mammal. Furthermore, judicious collecting is considered absolutely indispensable to serious ornithological research along certain important lines, namely, faunistics, systematics, migration and food studies.

A perusal of these carefully selected papers of the man who for many years was California's leading vertebrate zoologist leaves the reader with no shred of doubt that Grinnell was not only in the front rank of keen observers of wild life in its natural habitat, but that he has had few equals in ability to correctly interpret the many widely different phases of natural history as seen in the field.

The compilers of this book are to be congratulated for having rendered more available by putting into compact form a well chosen group of publications of very high scientific and educational value.—G. WILLETT.

MINUTES OF COOPER CLUB MEETINGS

NORTHERN DIVISION

OCTOBER.—The regular monthly meeting of the Northern Division of the Cooper Ornithological Club was held on Thursday, October 22, 1942, at 8:00 p.m., in Room 2503, Life Sciences Building, University of California, Berkeley, with Alden H. Miller presiding and about 125 members and guests present. Minutes of the Northern Division for September were read and approved. There were four proposals for membership: Grace Irene Crowe, 1420 Henry St., Berkeley, by May Titus; Marjorie Lillian Peterson, 2725 Ridge Rd., Berkeley, by Winifred M. Smith; and Donald Lynn McKevnan, 810 24th Ave., Seattle, and Albert Wolfson, Museum of Vertebrate Zoology, Berkeley, both by Alden H. Miller.

A letter from George Willett to Mrs. Hilda W. Grinnell was read, which expressed appreciation to members of the Cooper Club for his election to Honorary Membership.

Mr. Follett reported a Mockingbird from Modoc County on September 12. Mrs. Allen reported recent arrival dates of several migrants and winter residents in Berkeley, and Dr. Miller contrasted these, in general terms, with earlier arrival dates along the coast of Humboldt County.

Mrs. Dorothy Dean Sheldon, speaker of the evening, presented five excellent colored motion picture films. The major subjects were (1) shearwaters and other Pacific Coast birds, (2) American egrets in the San Joaquin Valley, (3) marsh birds in the Carson River Valley, Nevada, (4) common garden birds, and (5) desert birds in the Imperial Valley of California.

Adjourned.—FRANK A. PITELKA, *Acting Secretary*.

NOVEMBER.—The regular monthly meeting of the Northern Division of the Cooper Ornithological Club was held on Thursday, November 19, 1942, at 8:00 p.m., in Room 2503 Life Sciences Building, University of California, Berkeley, with Alden H. Miller in the chair and 37 members and guests present. Minutes of the Northern Division for October were read and corrected. Minutes of the Southern Division for September were read. Names proposed for membership were: Mr. Dean Amadon, American Museum of Natural History, New York City, N. Y., by W. Lee Chambers; Warren Fischer, 106 Magnolia Avenue, Piedmont, Calif., by Brighton C. Cain; William V. Mayer, Route 2, Box 3125, Del Paso Heights, Calif., by Alden H. Miller;

Daniel F. Tillotson, Museum of Vertebrate Zoology, Berkeley, Calif., by Frank A. Pitelka.

Mr. Miller reviewed "Wildlife Portfolio of the Western National Parks" by Joseph S. Dixon, a recent publication of the U. S. Government Printing Office, Washington, D.C. He commented on its pleasing form, and its usefulness in presenting to the park visitor the birds and mammals he would be most likely to see.

Mr. Dixon brought a heartening report from among his field observations. In one region of California there was a great increase in the number of White-tailed Kites, two pairs present in April apparently having been able to rear two broods each. This was correlated with an abundant population of *Microtus*. Mr. Covel spoke of the annual duck banding at Lake Merritt on November 5, and Mrs. Austin noted that 1105 birds were handled, 600 of these being banded for the first time.

The speaker of the evening, Mr. Joseph Dixon, entitled his talk, "Fading Trails," from the book of that name, dealing with diminishing wildlife forms. Reproductions of the colored plates originally planned for the book were shown as lantern slides.

Adjourned.—FRANCES CARTER, *Recording Secretary*.

DECEMBER.—The regular monthly meeting of the Northern Division of the Cooper Ornithological Club was held on Thursday, December 17, 1942, at 8:00 p.m., in Room 2503 Life Sciences Building, University of California, Berkeley, with Alden H. Miller in the chair and 55 members and guests present. Minutes of the Northern Division for November were read and approved. Names proposed for membership were: Florence Anne Henderson (Mrs. R. N.), 3922 Broadway, Sacramento, Calif., by E. L. Sumner; Mrs. Blanche Wallace, 750 Pine Street, San Francisco, California, by Junea W. Kelly. A standing order of business calls for the appointment of a nominating committee at the December meeting. A telegram from the president, E. Lowell Sumner, named Jean M. Linsdale, John T. Emlen, and Mrs. J. T. Allen, chairman.

A letter was read from Dr. T. Eric Reynolds who finds opportunities to study birds of south Pacific islands in spite of his naval duties.

As speaker of the evening, B. C. Cain described his summer's field work at Camp Phillmont, in the Sangre de Cristo range of New Mexico, illustrating his talk with Kodachrome slides of exceptional beauty. This camp, the largest in the world devoted to youth, comprising some 127,000 acres, was presented to the Boy Scouts of America, together with the means for maintaining it, by Waite Phillips.

Adjourned.—FRANCES CARTER, *Recording Secretary*.

SOUTHERN DIVISION

OCTOBER.—The regular monthly meeting of the Southern Division of the Cooper Ornithological Club was held on Tuesday, October 27, 1942, at 8:00 p.m., in Room 145, Allan Hancock Foundation, Los Angeles, California, with President Sherwin F. Wood in the chair and 92 members and guests present. Minutes of the Southern Division for September were approved as read. Minutes of the Northern Division for August and September were read. Two applications for membership were presented as follows: Mrs. A. W. Kildale, 1402 D St., Eureka, Calif., proposed by W. Lee Chambers; and Miss Anita Syrek, 4905 Gaviota Ave., Encino, Calif., proposed by Loye Miller.

George Willett gave an interesting report on the Annual Meeting of the American Ornithologists' Union held recently in Philadelphia. He stated that the meeting was very well attended by approximately 150 members plus many local guests. He summarized for us a number of the papers which were presented at the meeting. The Cooper Club takes just pride in knowledge of the fact that Mr. Willett was elected First Vice-President of the A.O.U. at the 1942 meeting.

Mr. Willett announced receipt of a new publication, "The Blue Goose," by J. Dewey Soper, issued by the Department of the Interior, Northwest Territories and Yukon Branch, Ottawa, Canada.

The program of the evening, "Wildlife of Australia," was then presented by Mr. Ed Harrison and Mrs. Frances Roberts, of Encinitas, California. The subject matter comprised five reels of sound motion pictures, four of which were loaned by the Australian News and Information Bureau, of New York City, and one of which was rented from the Filmosound Library, of Hollywood.

Adjourned.—JACK C. VON BLOEKER, JR., *Secretary*.

NOVEMBER.—The regular monthly meeting of the Southern Division of the Cooper Ornithological Club was held on Tuesday, November 24, 1942, at 8:00 p.m., in Room 145, Allan Hancock Foundation, Los Angeles, California, with George Willett in the chair and 21 members and guests present. Minutes of the Southern Division for October were approved as read. Two applications for membership were read, as follows: Pfc. Harry James Fletcher, U.S.M.C., 2851 Community Ave., La Crescenta, Calif., proposed by Jack C. von Bloeker, Jr.; and Mr. Richard Hayes Robinson, 949 So. Hudson Ave., Los Angeles, Calif., proposed by Jack C. Couffer.

Mr. Willett reported that Dr. Loye H. Miller was enjoying better health and wished to be remembered to his many friends. Mr. Willett brief-

ly commented upon the transportation problem, asking for suggestions of members concerning future meetings. Dr. I. D. Nokes suggested holding the next meeting as scheduled.

Mr. W. A. Kent reported seeing American and Ferruginous Rough-legged hawks in San Bernardino County in October.

Mr. Willett introduced Dr. Carl G. Kadner of Loyola University, Los Angeles, who spoke upon the subject "Bird Malaria." The role that the study of bird blood parasites has played in aiding the work on the most serious world disease of man has been and still is a very important one. Approximately 10 per cent of southern California birds harboring blood parasites are found infected with bird malaria, according to Dr. Kadner's records.

Adjourned.—SHERWIN F. WOOD, *Acting Secretary*.

DECEMBER.—The regular monthly meeting of the Southern Division of the Cooper Ornithological Club was held on Tuesday, December 29, 1942, at 8:00 p.m., in Room 145, Allan Hancock Foundation, Los Angeles, California, with I. D. Nokes in the chair and 35 members and guests present. The minutes of the Southern Division for November were approved as read.

Sherwin F. Wood reported the appointment of George Willett, chairman, Hildegard Howard and Howard Robertson as the committee for nomination of officers for the Southern Division for 1943. Mr. Willett reported a communication from Alden H. Miller announcing the abandonment of the 1943 Annual Meeting.

Dr. Nokes introduced Miss Irene Tillinghast of the Los Angeles Museum whose subject was "Behavior Studies of Young Brewer Blackbirds and Cliff Swallows." The adventures of this "good samaritan" of birds completely absorbed the interest of every member of the Club fortunate enough to be present. Miss Tillinghast has doctored and reared a number of young birds, including a Cliff Swallow, Brewer Blackbirds, a California Shrike and a Horned Lark. Most of the lecture dealt with the life history of "Susie," a Brewer Blackbird which was brought to her as a nestling with a fractured leg. Some of this bird's behavior was demonstrated by a short color film and by the personal appearance of "Susie" who, although much excited by the company, demonstrated her responsiveness to Miss Tillinghast's directions.

A motion extending a vote of thanks to Miss Tillinghast and her assistant, Mr. Melville Lincoln, for this unusual, interesting, and entertaining study of bird behavior received unanimous approval.

Adjourned.—SHERWIN F. WOOD, *Acting Secretary*.





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